Grondsporen 57

House plan analysis Hallum-Hellema (Friesland)

A three-dimensional reconsideration of the early medieval turf buildings

Daniel Postma (Archaeo Build), Madderty, Scotland (September 2020).

university of groningen / groningen institute of archaeology / terp research group

This study is part of the project Terpen- en Wierdenland

Colophon

House plan analysis Hallum-Hellema (Friesland). A three-dimensional reconsideration of the early medieval turf buildings

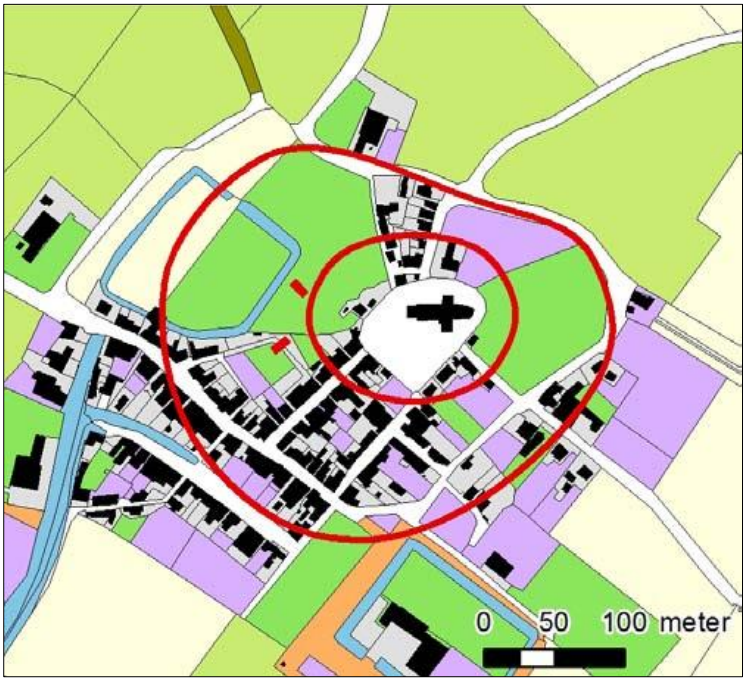
Cover photo: Early 19th-century Víðimýri turf church in Skagafjörður, Iceland; photo by the author.
Photo's and drawings: Author and ARCbv

Grondsporen: Opgravings- en onderzoeksrapporten van het Groninger Instituut voor Archeologie 57

ISSN: 1875-4996
Groningen Institute of Archaeology
Poststraat 6
9712 ER Groningen, Netherlands

Contents

Aerial photograph of the village of Hallum, viewed towards the north. Beyond the village are embanked and present-day salt marshes, and then the Wadden Sea. Photo © Terpen- en Wiedenlandproject/Aerophoto Eelde.



Hallum on the cadastral map of 1832. The Roman-period and medieval terp phases are outlined in red. The red rectangles represent excavated houses that were identified by Tuinstra *et al*. (2011) in the excavated area. From De Langen & Mol, 2016: fig. 5.

Preface

Hallum is one of the artificial dwelling mounds or *terps* along the coast of the Wadden Sea in the province of Friesland, and the name of the village that is situated on this terp. In 2007, the planned construction of a new nursing home on this archaeologically highly valuable location made it necessary to execute an archaeological excavation, prior to the start of construction work. The excavation revealed archaeological structures of high density, from the Roman Period to the Middle Ages (Nicolay *et al.*, 2018; Tuinstra *et al.*, 2011). The archaeological features were hard to disentangle, and it was impossible to fully explore the scientific potential of the many structures in the archaeological site report.

In 2014, a grant from the Dutch *Waddenfonds*, in the context of the project *Terpen- en Wierdenland. Een verhaal in ontwikkeling* (The terp region. A developing story), made it possible to further investigate the archaeological structures of Hallum, especially the turf buildings of the Early Middle Ages. These buildings belong to a highly interesting phase in the habitation history of the terp region of the northern Netherlands. Hallum, like many other terps in the northern Netherlands, was abandoned in the 4th century AD. New settlers arrived in the terp region in the early 5th century, bringing with them a new material culture. Their pottery and brooches indicate that they came from the region between Elbe and Weser and from the west coast of Schleswig in present Germany. The walls of their houses were made of turf instead of the wattle-and-daub that was customary before the habitation hiatus. The present study is focusing on this intriguing period, during which not only new settlements were built, but also a new identity emerged in the communities of the new settlers in the terp region. This study on the houses thus complements another *Terpen- en Wierdenland* product: a study of the pottery from the excavations at Wijnaldum (1991-1993), which has this period as one of its main areas of attention (Nieuwhof, 2020).

We are lucky to have found Daniel Postma willing to carry out this research on the turf houses of Hallum. His great expertise in this field, which is evident from various publications, especially his book om medieval farmhouses of 2015, made him the right person for the job. He has succeeded in bringing clarity in the complicated early-medieval structures at Hallum. The results are for now published in this report, but this publication is meant to be an important building block in an encompassing study on early-medieval house building in the wider North Sea area.

Several organisations financed and successfully cooperated in the Waddenfonds project *Terpen- en Wierdenland. Een verhaal in ontwikkeling*: the Terp Research group of the Groningen Institute of Archaeology (University of Groningen), the Province of Fryslân (Friesland), the Province of Groningen, Landschapsbeheer Groningen, Landschapsbeheer Friesland, the Museum Wierdenland at Ezinge, and the municipalities of De Marne, Eemsmond and Delfzijl. We would like to thank these organisations for their generosity.

Dr. Annet Nieuwhof
Terp Research Group/Groningen Institute of Archaeology

Introduction

In 2007, the planned construction of a care home in Hallum, situated in the northerly province of Friesland (the Netherlands), led to the partial excavation of this town's *terp.* The *terps,* in plural, are characteristic of pre- and early historic habitation along the southern coast of the Wadden Sea. They were raised through intentional expansion and heightening, intended to create and maintain safe settlement locations in an otherwise level area that was regularly exposed to shallow but near-complete inundation. Consequently, the ongoing process of terp formation encapsulated many physical remains of day-to-day activities, embedding these in clay-rich soil and presenting us with unique and generally well-preserved archaeological records today.

The housing development in Hallum, on the former site of the Hellema biscuit factory, required part of the town's archaeological deposits to be preserved *ex situ,* or in other words to be carefully removed and recorded by means of archaeological excavation. In total, three successive excavations were conducted by Archaeological Research & Consultancy (ARC), including a test trench in March, a full-scale excavation from May to August and a brief complementary excavation in September 2017. As will be explained in more detail in chapter 1, terps are complex sites to record and interpret under the best of circumstances, and since the circumstances in Hallum-Hellema were not ideal the project's final report could not explore the full potential of the site's well-preserved building remains (Tuinstra *et al.*, 2011); Fig. 1).

Fig. 1. East profile showing sections through various turf-walled buildings.

In terms of house plans, the report of Hallum-Hellema was the first to distinguish two subtypes of early-medieval turf buildings, otherwise known as the Leens type: plans from relatively long and narrow buildings (subtype A) and those from wider but relatively short buildings (subtype B). Furthermore, plans had been recognised that reflected the area's late-7th and early-8th-century AD transition from an apparently exclusive use of turf-walled houses towards a renewed predominance of buildings with wattle and daub walls.

The ground plans from Hallum-Hellema and the design changes these were believed to illustrate, have been influential in the making of a more detailed development model of early-medieval house building customs in the terp area. The notion of two complementary types of turf house existing

within a single settlement at the same time, allowed archaeological settlement research in the north of the Netherlands to break away from an older typological paradigm that still prevails in much of the region's post-excavation work today (see section 1.2). The traditional model emphasises the past use of fully-fledged longhouses, that is: long rectangular buildings that incorporate living, working and byre areas under the same roof. A more nuanced typology was first explored by the current author in his Master thesis on early-medieval salt marsh architecture and built upon in later writings (Nicolay and Postma, 2018; Postma, 2015, 2010).

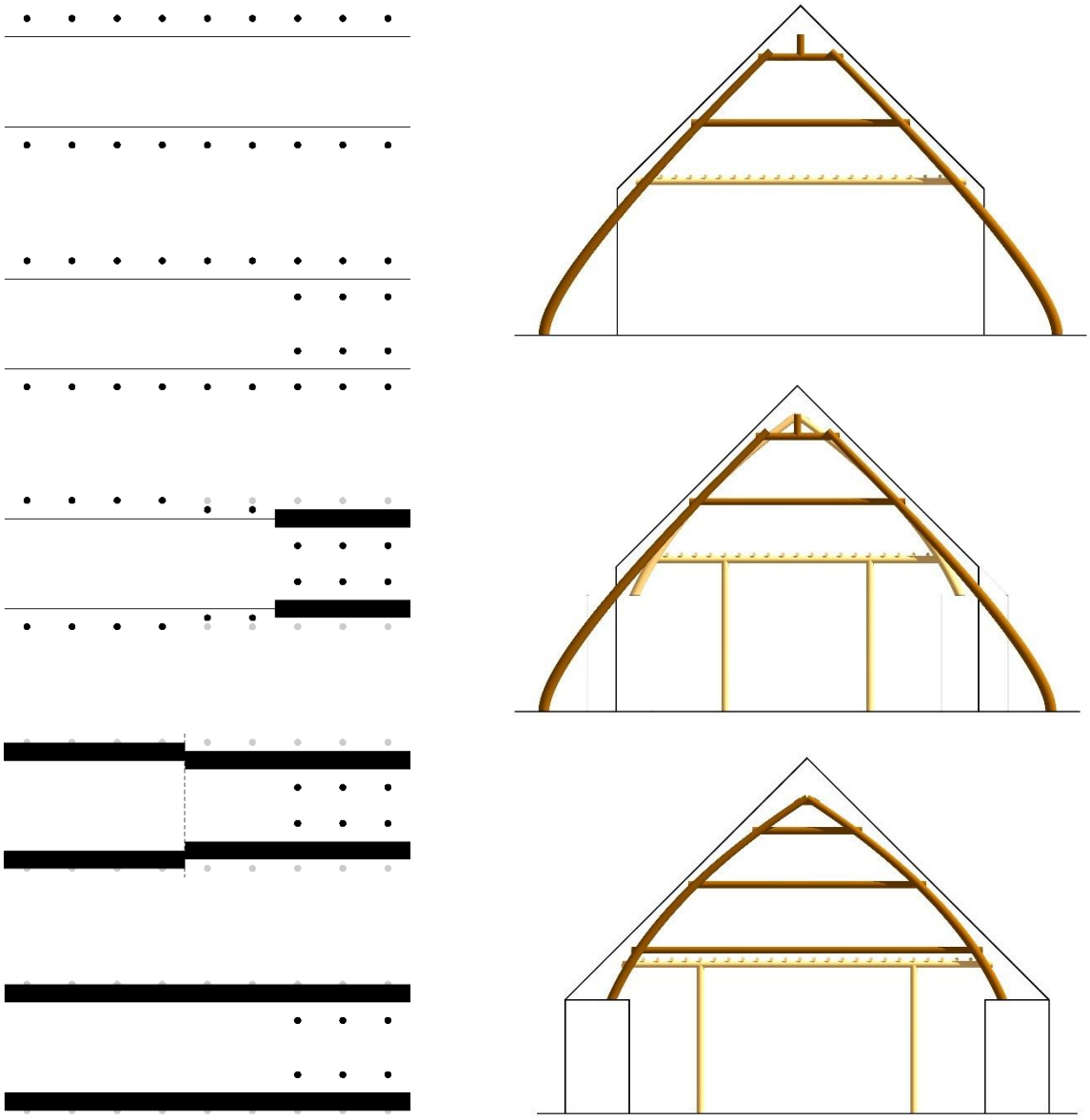


Fig. 2a (left). Idealised house plans from several early medieval farm types in the Odoorn group. For comparison, the topmost plan is reproduced as a light grey backdrop to the other house plans. From top to bottom: type Odoorn C, Katwijk B, idem variation Den Burg, Leens A en B (here showed adjoined, separated by a dashed line) and Leens AB. Not to scale.

Fig. 2b (right). Principle cross sections through three farm types in the Odoorn group, reconstructed of cuppill ('cruck') construction (see brown timbers). In the background (yellow timbers), byre areas and lofts are shown. From top to bottom: type Odoorn C (Drenthe), Katwijk B variation Den Burg, Leens AB. Interior widths: 5 m.

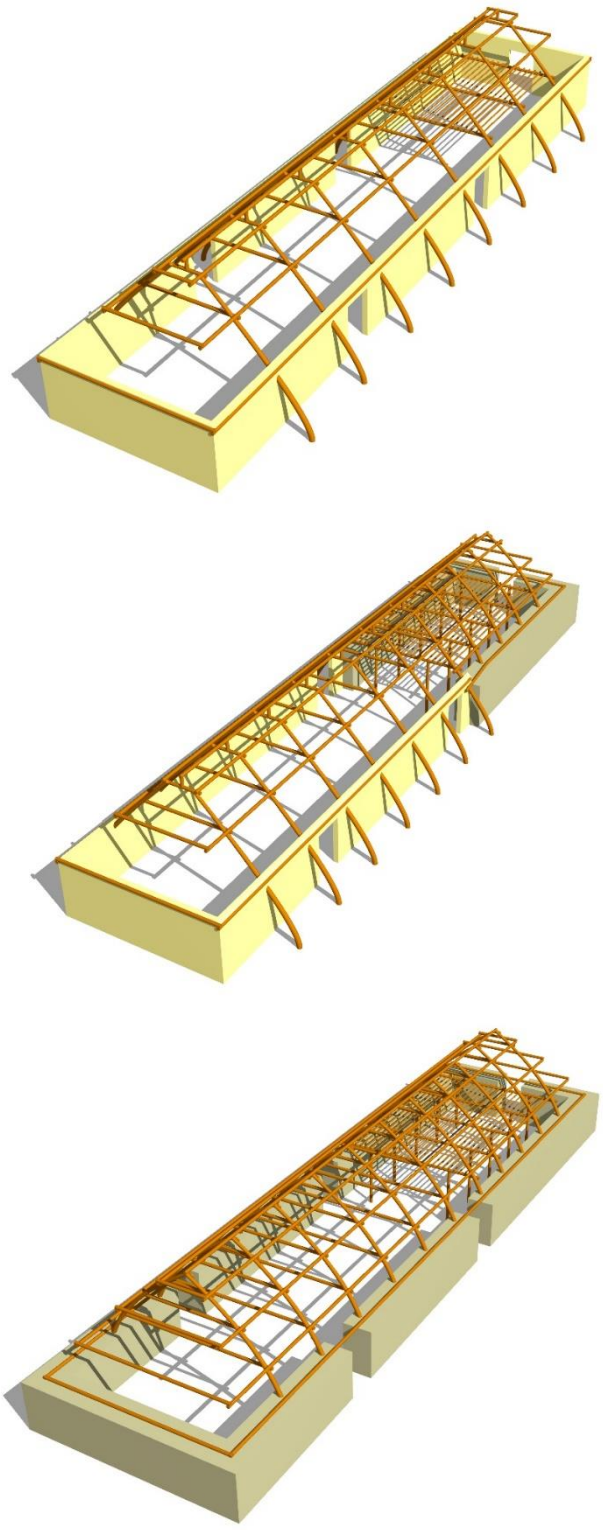


Fig. 2c. Three-dimensional reconstructions of the farm types in the previous image (Fig. 2b). The 'timber' building elements are represented by daubed walls (yellow) and load-bearing exterior posts, and the turf buildings with (partially) load-bearing turf walls (green-grey). Interior widths: 5 m.

The newer, updated framework for the classification of early-medieval farm buildings in the north of Netherlands, proposes that terp dwellers and their livestock were in fact housed in separate buildings during the 6th to late 7th or early 8th century (Postma, 2015, pp. 72–75). This setup changed as the building customs of their Anglo-Saxon forebears gradually became more aligned with those found in the sandy areas further inland, leading first to the reintroduction of longhouses as the dominant house form along the coast, and latterly to the return to wattle and daub walls already mentioned above (Postma, 2015, pp. 164–170); Fig. 2). Although this new development model fits well with the plans of turf and timber buildings excavated in various parts of the terp region, it did little to improve the plans from Hallum-Hellema itself.

The project *Terpen- en Wierdenland. Een verhaal in ontwikkeling* (The terp region. A developing story), offered the opportunity to focus on the house plans from Hallum-Hellema specifically and establish what more we may learn from them. For reasons set out in the rest of this report, there are now fewer ground plans from Hallum-Hellema and much of the site's original narrative on houses cannot be sustained by the available evidence. However, the various attempts that were made to draw more detailed but also more reliable information from the archaeological records, mean that the post-excavation approach itself became a central part of the 'developing story'.

1. Methodology

1.1. Past and current terp excavations

To fully appreciate this project's approach to the house plans from Hallum-Hellema, we must first consider the traditional fieldwork and post-excavation methodologies used in terp archaeology. Put very briefly, terp excavation methods derive from a combination of techniques that were historically used for the excavation of prehistoric burial mounds, on the one hand, and large truncated settlement sites on sandy soils on the other. The latter became very prominent in the north of the Netherlands during the 1960s and '70s, when the reorganisation of agricultural fields and the availability of mechanical excavators enabled large areas of ploughed topsoil to be removed relatively easy, thus exposing posthole negatives and other settlement traces in the undisturbed sandy subsoil (Waterbolk, 2009, pp. 22–35). In the resultant, large excavation trenches, small vertical sections (called *coupes*) would be made through individual (clusters of) these anthropogenic soil features to establish their shape, content, formation and stratigraphic relation with other features.

Fig. 3. Impression of the excavation at Hallum-Hellema, showing level and profile, metal detecting and drawing table.

The older technique of excavating burial mounds was to remove opposing quarters of the monuments in a succession of excavation levels, leaving full vertical sections (called profiles) through the sites standing. Referred to nowadays as Professor Van Giffen's *kwadrantenmethode* (quadrant method), this approach better acknowledged the three-dimensional nature of the mounds. It is against this brief historical background that the current excavation method of settlement mounds along the northern coast can be understood. The terps are excavated in a succession of excavation levels, at intervals of circa 20-30 cm, with small sections to aid our understanding of individual features, whilst larger profiles are left standing to provide sections through the mound as a whole (Fig. 3; Nicolay 2014).

The historic exploitation, in the late 19th and early 20th century, of terp soil as agricultural fertiliser has left behind numerous partially excavated terps. More recently, the escarpments (called *steilkanten*) of these partial terps were pared back to produce large profiles. Early trials in Peins and Dongjum (Friesland) in 1998 and 1999, Englum and Wierum (Groningen) in 2000 and 2004, and Anjum-Terpsterweg (Friesland) in 2006 showed that such profiles are crucial to better understand and model the special development of these dwelling mounds (Bazelmans *et al.*, 1999; Nicolay, 2010; Nieuwhof, 2008, 2006). Consequently, a dedicated *steilkanten* project was started by the University of Groningen and the Province of Friesland in 2009 (Nicolay and Langen, in prep.). How to adequately recognise, record and interpret these complicated three-dimensional sites in horizontal excavation levels, however, has not yet been addressed in similar research projects.

That there is indeed a need to address this last matter is borne out by the great difficulties earlier terp archaeologists evidently faced during their post-excavation work. Many large terp excavations up to the 1990s are to this day largely unpublished. The emergence of developer-funded archaeology since the late 1990s and early 2000s may appear to have resolved this problem, resulting in the full publication of similarly large terp excavations – Leeuwarden-Oldehoofsterkerkhof and Hallum-Hellema (Dijkstra and Nicolay, 2008; Tuinstra *et al.*, 2011). It has not yet been assessed, however, if this new-found productivity comes with any significant downsides to the archaeological recording and interpretation of these important settlement sites. Put differently: how can it be that these more recent excavations could be fully published while there was no fundamental change in excavation methodology compared to the earlier, unpublished projects? The current report has, in modest terms, started to address this important question.

1.2. Conventional post-excavation approach

Just as important as our understanding of how terps are normally excavated, is how the post-excavation work is conducted. Again, the customs adhered to in the terp region originated from approaches developed for the sandier parts of the Netherlands. Within this prevailing research tradition, house plans are primarily discerned by seeking out linear and curved arrangements in clusters of postholes. Whether or not these arrangements are meaningful is ideally confirmed through careful comparison of the size, shape, colour, contents and (stratigraphic) age of the postholes. The documentation of any archaeological fieldwork should be such that this entire process can be done, and indeed repeated, (long) after the excavation has been completed.

In the north of the Netherlands, the University of Groningen's historic research interest in typological classification models for archaeological house plans remains very influential in the way these plans are discerned and published today (Waterbolk, 2010, 2009). A natural consequence of this approach is that visually prominent features are prioritised over more subtle but perhaps also more meaningful characteristics of these former buildings. One of the most extreme manifestations of this problem concerns the typological differences between early-medieval turf-walled houses (Leens types) and their predominantly timber-built counterparts (Odoorn and Katwijk types). The former were long held to be an architectural side track, but upon closer consideration of their interior dimensions, use of space, construction technology and underlying design principles, the turf

houses were found to have been very similar to contemporary timber buildings (Postma, 2015, pp. 69–72). Through its ignorance towards the greater significance of house plans, particularly in terms of their wider societal meaning, conventional typological classifications are said to have become the be-all and end-all of post-excavation analyses of building remains (Theuws, 2014; Van der Velde, 2010). This concern is currently being addressed by the Cultural Heritage Agency of the Netherlands (RCE) through the development of a guidance note on the archaeological study of house plans (Huijbers *et al.*, in prep.).

Fig. 4. Example of a hard-to-read excavation level.

The processing of house remains from terp excavations presents further complexities, first because these remains are more difficult to make out in terp excavations than what may be expected for settlement sites in the sandy soils further inland. In many cases, building remains can be hard to distinguish from other features such as ditches and terp layers, because all of these are either constructed from turf or backfilled with turf (Nicolay, 2008, p. 43).[1] Furthermore, if terp excavators are to discern any features at all, neat surfaces need to be created at each level of the excavation, but in the clay soils of a terp this is very labour intensive to do by hand and is therefore more commonly done to a lesser standard with mechanical excavators (Fig. 4). Lastly, rain, wind and sun may impact greatly on the readability of these exposed surfaces by causing smearing, cracking and discolouration of soil of features and their contexts. All these challenges, in addition to the pressures from time and funding restraints, were faced during the excavation in Hallum (see section 2.2). What is of relevance here, is that all these challenges may cause features to be overlooked or misinterpreted during excavation, in turn impacting negatively on the post-excavation process.

A second added complexity of terp excavations derives from the three-dimensional nature of these settlement sites. Their complex spatial development commonly cause building remains to be excavated over multiple levels. This is true especially for buildings that were originally constructed on a sloping part of a terp or those that featured a combination of turf walls and postholes, the former being preserved from ground level up while the latter leave traces from ground level down. Contemporary outbuildings, storage structures, wells and ditches may be visible in a yet wider range of excavation levels. It will be evident that the challenging fieldwork conditions and spatial complexity of terp excavations jointly result in a very demanding post-excavation process.

In practical terms, the process of recognising house plans in terp excavations is similar to what has already been set out above – starting with visually identifying alignments of features. As an analogue process, using paper copies of excavation plans, this identification process can be done by colour coding preliminary selections of features. The process becomes much more complex, however, when the vertical spread of features in terp excavations is considered. A preference from the current

[1] This concerns fragments of salt marsh turf which is clearly recognisable by its alternating clay and silt layers produced by the periodic inundation of this coastal region at the time of terp formation.

author is to copy the proposed selection from one excavation level onto tracing paper and use that as a transparent overlay for a comparison with features recorded in higher and lower levels. As ground plans start to take shape, the relevance of less distinct features may also become evident, for example when these are found to complete a row of postholes or concern a dung-filled ditch where one may expect to find a byre drain in a building's interior. Before concluding the composition of a ground plan in this manner, it is important to consider if and why other features found in the same area did or did not belong to the same building. Moreover, these preliminary selections of features should be verified by checking whether their cross sections and associated finds do indeed support the notion that these features may have formed a larger whole.

1.3. Digital post-excavation approaches

Unfortunately, the review of house plans from Hallum-Hellema brought further challenges to those set out in the previous section. There are several reasons for this. Firstly, the original permatrace field drawings have been missing since ARC went bankrupt in 2013.[2] Secondly, the trench plans that were published in the original excavation report do not include any shared points of reference, making it impossible to reliably lay one over another to compare features from multiple levels. Thirdly, the published plans cannot be accurately aligned with any of the profiles through (sections of) the terp. All these issues meant that an alternative approach had to be found for the current project.

A potential solution was found in the digital files from Hallum-Hellema, which had been deposited in the Northern Archaeological Depot (NAD) in Nuis, Groningen, where the excavation's finds are also held. These files included vectorised copies of the original excavation drawings. The excavation levels in these files could be reliably superimposed on each other using a geographic information system (GIS), because they contained the relevant spatial data. Instead of printing these drawings, it was decided to test whether the published house plans could more reliably be reviewed in the GIS. It was soon found, however, that the position of the terp profiles in relation to the excavation levels remained difficult to ascertain because the mapping programme was not intended for dealing with plans in three dimensions.

Due to the importance of profiles for the interpretation of a terp's spatial development, as discussed in section 1.1, a more adequate solution was required still. To this end, the vectorised excavation drawings were imported into 3D modelling software (see section 1.4.1). This allowed the excavation levels and terp profiles to all be placed in the correct position relative to each other and rotated freely to view the entire excavation and all features from any angle. Moreover, within this three-dimensional model the height differences between excavation levels could better be taken into consideration throughout the course of this project.

Once again, a review of the house plans was attempted. First, all features were coloured according to their published interpretation, using the colour-coded maps and profiles (Appendices 2-10) in the excavation report as a guide. Subsequently, the published house plans were reviewed from the perspective of developing a functional typology (see section 3.2), a recent adaptation of the conventional post-excavation approach discussed above. Put briefly, developing a functional typology goes beyond the basic classification of house plans as it also considers how the original buildings were designed, constructed and used (Nicolay and Postma, 2018; Postma, 2015). In this way, features that are of lesser importance to the house plans' general appearance may still be attributed to individual structures and, more importantly, included in these buildings' wider societal interpretation.

[2] Personal communication S.J. Tuinstra, former ARC project leader for Hallum-Hellema, 5 February 2018.

At last the review of ground plans from Hallum-Hellema appeared to be successful and provisional overviews of the updated trench plans were produced for excavation levels 1-8. These plans included simple guidelines to indicate how partially preserved features related to a building's original layout. Furthermore, as a start was made with exporting individual house plans. Throughout the entire process, any interpretation that seemed uncommon, unlikely or otherwise uncertain was checked against the original excavation photographs and features table. Through this spot-check verification process, however, it gradually became more evident that many features could not have been what they were made out to be. Consequently, many of the previously published house plans and indeed their updated versions prepared by the current author, started to fall apart entirely.

The fourth and final approach to reviewing the house plans from Hallum-Hellema started with an exhaustive review of all 3352 features. Only when their classification had been verified first, could the composition and interpretation of house plans be reliably based on the archaeological evidence. The most important observations regarding the classification of individual features are set out in chapter 2. The workflow that was developed for producing the three-dimensional wireframe model is summarised in section 1.4 onder.

1.4. Workflow for three-dimensional modelling

1.4.1. Importing the spatial data

The GIS files that had been deposited at the archaeological depot in Nuis are vectorised versions (in .mif format) of the original excavation drawings. They were first opened in QGIS and then exported in a file format (.dxf) that could be opened in the 3D modelling programme Rhino.[3] These digital drawings included all features (and fills) from all excavation levels in all nine trenches, and all three profiles. Unfortunately, feature sections had not been digitised and could therefore only be consulted if they had been published in the site report or photographed.

Other spatial information that was imported into Rhino were the heights of the excavation levels. These are dumpy level measurements which were archived as a separate database table (.xls format). As there was no evident way to automatically convert these measurements to point locations in Rhino, every second measurement was plotted by hand. Unfortunately, the height measurements of two excavation levels (trench 8, level 9-10) had been recorded without X and Y coordinates and could therefore not be plotted. For several other levels it transpired that no height data had been recorded (or digitised) at all.[4]

1.4.2. Organising the spatial data

All imported spatial data was organised in separate layers so that the visibility of individual parts of the 3D model could easily be switched on or off. More layers were added to organise later changes and additions to the model, resulting in the following basic layer structure:

- Texts and icons
    - names of structures and views
    - scale bar and north arrow
- Structures
    - contour lines and surfaces relating to individual structures
        - help lines (e.g. guidelines in house plans)
        - elements not included in the final house plans
- Profiles (for the eastern, northern and trench 9 profile individually)

[3] The software versions used in this project were QGIS version 3.10.5 (A Coruña) and Rhino 6.
[4] These were trench 8, levels 11-12; trench 7, level 5; trench 6, levels 4-8; trench 5, levels 5-8; trench 3, level 8.

    - different sections of the profiles (e.g. top and bottom)
        - feature contours
        - fill contours
        - colour-coded hatches
        - help lines (e.g. for manipulating/calibrating position of profiles)
- Trenches (for trenches 1-9 individually)
    - excavation levels (for each level individually)
        - feature contours
        - fill contours
        - colour-coded hatches
        - help lines (e.g. for projecting orientations of features, including ditches)
- Copies (for referring to after later changes)
    - features colour coded as classed in verified features table
    - previous interpretations of house plans and associated features (e.g. ditches, wells, pits, etc.)

1.4.3. Building the 3D model

As they were imported, all excavation levels were already correctly positioned in horizontal directions. This meant that no changes needed to be made to their X and Y coordinates. To add the third dimension and properly develop a spatial wireframe model, each excavation level was moved vertically to where its corresponding height measurements had been plotted (Fig. 5). As most levels had in reality been made to tilt slightly to one side, allowing rainwater to run off, their digital renditions were tilted accordingly. The use of a mechanical excavator proved at this stage to be beneficial to the three-dimensional post-excavation process because this had produced consistently smooth surfaces for each level. This meant that no further manipulations were needed to accurately position each level in the digital model. Moreover, not having any undulations in the digital excavation levels greatly benefitted the ease with which the feature contours could later be hatched because it avoided the need for more complicated methods of creating digital surfaces. The maximum vertical inaccuracy of the excavation levels was judged by the plotted height measurements to be circa 10 cm.

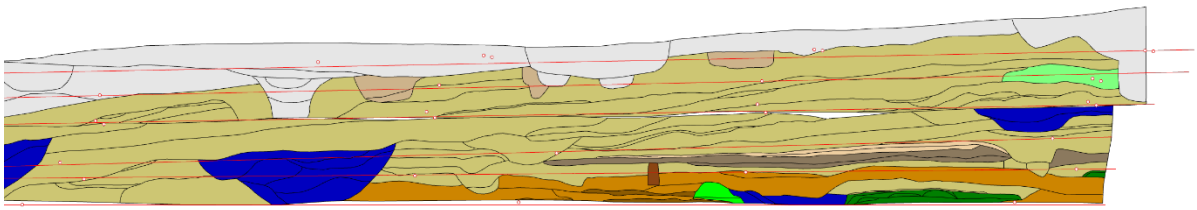


Fig. 5. Height and angle of excavation levels (red lines) of trench 1, based on plotted dumpy level measurements (red dots), seen against east end of north profile.

More challenging was the accurate positioning of those excavation levels without complete spatial data (see section 1.4.1). The height of these levels was indirectly determined through comparisons with calibrated levels in adjacent trenches, the position of higher and lower levels in the same trench and the alignment of prominent features (e.g. walls, ditches and pits) that were also recognisable in the profiles. In a similar way, the profiles themselves were carefully orientated to align them with the edges of adjacent trenches and features in calibrated excavation levels (Fig. 6). The two longest sections of the eastern profile had to be cut in two or three shorter sections to align them fully with the relevant trench contours. The profile along the eastern edge of trench 9 had been drawn to a 3:1 scale and was therefore tripled in size to fit the wireframe model. Because the trench edges were distinctly irregular no perfect match with the profiles could be achieved, horizontal inaccuracies possibly exceeding 60 cm in the worst areas. It was later experienced, however, that this specific issue was not of great concern to the useability of the digital model for the purpose of this project.

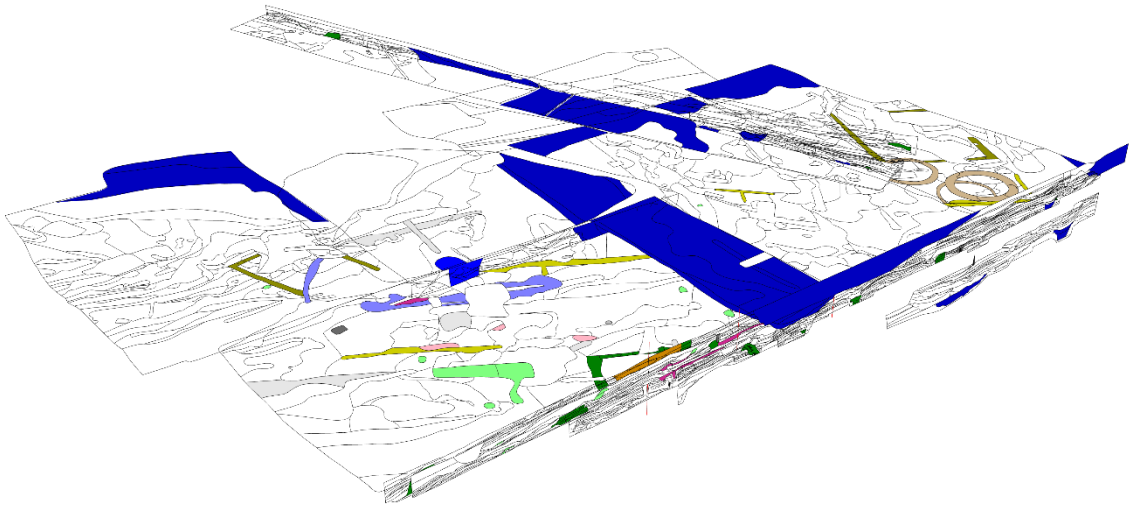


Fig. 6. Perspective overview of the wireframe model, showing coloured features in excavation level 4 in all trenches after review of their classification prior to composing the house plans. Looking northwest.

1.4.4. Classifying the features

It has already been explained in section 1.3 boven why the classification of all the features (N = 3352) that were recorded in the excavation needed to be reviewed. To this end, any feature classification that could be directly relevant to the settlement's spatial development and organisation (e.g. ditches and revetments) or its buildings (e.g. posts and turf walls) were marked in the digitally deposited features table. The classification of each of these features was checked against the published plans in the excavation report, digital photographs of the excavation levels, sections and profiles, and the immediate context of the features in the excavation's digital model. Regarding the latter, the three-dimensional wireframe model proved to be very useful for checking whether features recorded in one level were also recorded in other levels or any of the profiles. As will be discussed in more detail in chapter 2, this elaborate verification process in many cases helped to clarify whether or not the existing classification of a feature could be marked as confirmed, likely, possible but unconfirmed, or incorrect. Feature numbers, their original classification (as recorded and published), their reviewed classification and the basis of that most recent classification were recorded on a note page attached to each individual feature in the wireframe model.

Other operations regarding the digital 3D model, included the hatching of all features that were either marked in the features table or any of the trench plans published in the excavation report. Also hatched were any features that on the basis of their position or (linear) appearance in plan could be thought to concern building remains. The classifications of the latter, too, were checked in the feature table and photographs. Initially, all feature contours that were hatched were coloured white, but as their classifications were either confirmed or considered likely, the hatches were coloured to visually reflect these results. An overview of all classifications that were marked, checked and coloured in this exhaustive verification process is presented in Table 1.

During the subsequent composition and interpretation of the house plans, features from other classifications were checked and added as required. Examples of these are water wells, ash layers and animal depositions. The colour-coding used to visually clarify the nature of features in the digital excavation model, are based on the colour scheme from Waterbolk's (2009) house plan typology but with various additions to meet the demands of the current project. For all but a few colour codes, distinction has been made between classifications that were confirmed and those that remained less certain (Table 2).

Code	ABR*	classification
BES	*beschoeiing*	revetment (posts)
FUN	*fundering*	foundation (trench)
GRW	*wandgreppel*	wall ditch
HA	*haard*	hearth
KG	*kringgreppel*	circular ditch
PA	*houten paal*	timber post
PG	*paalgat*	posthole
PGK	*paalgatkuil*	posthole pit
PK	*paalkuil*	post pit
PL	*plank*	board
PLG	*plaggen*	turves
PLW	*plaggenwand*	turf wall
RUI	*ruimte*	interior space
SK	*staagat*	stake hole
SL	*sloot*	ditch
VR	*vloer*	floor
ZO	*zoden*	turves

*Table 1. Feature classifications checked before reviewing the house plans. *Archaeological Basic Register.*

Classification	Confirmed	Likely/subphase
Post and post hole	RGB 0.0.0	RGB 190.190.190
Post pit	RGB 105.105.105	RGB 230.230.230
Timber side view/board	RGB 139.69.19	RGB 244.164.96
Turves and turf wall	RGB 0.127.0	RGB 127.255.127
Wall ditch	RGB 139.139.0	RGB 205.205.0
Wattle and daub wall	RGB 139.134.78	RGB 238.230.133
Floor layer	RGB 139.90.0	RGB 255.192.76
House fill	RGB 205.133.0	RGB 255.210.127
Byre drain or deep litter byre	RGB 205.112.84	RGB 255.140.105
Wall ditch	RGB 139.139.0	RGB 205.205.0
Pit (indetermined)	RGB 205.179.139	RGB 255.222.173
Entrance pit	RGB 139.121.94	RGB 255.222.173
Inhumation or (ritual) deposition	RGB 125.38.205	RGB 165.140.255
Stone	RGB 205.0.205	RGB 255.191.255
Hearth/ash or burn layer	RGB 205.41.144	RGB 255.181.197
Brick	RGB 191.0.0	RGB 255.127.127
Ditch or watercourse	RGB 0.0.191	RGB 127.127.255
Water well	RGB 0.0.255	RGB 191.191.255
Occupation layer (dirty)	RGB 139.121.94	RGB 238.207.161
Terp layer (clean)	RGB 205.198.115	RGB 255.246.143
Disturbed topsoil	RGB 230.230.230	
Trampled subsoil	RGB 255.255.0	
Undisturbed subsoil	RGB 255.255.220	

Table 2. Colour codes for feature classifications, including RGB (Red, Green, Blue) values.

1.4.5. Discerning the house plans

After the review and classification of the features, as just set out in section 1.4.4 boven, selections of these features could be made to compose the actual house plans. Prior to starting this process, all features that were annotated and coloured according to their verified classifications, were copied to a separate layer group in the digital model. This ensured that the discerning and further analyses of house plans could be restarted from this same point if mistakes or other factors were to upset the rest of the process.

A second pass of the features could now be safely conducted, focussing less on their individual classification and more on their spatial and functional relationships with features in their immediate

surroundings. It had by this time become evident, however, that many of the published house plans were not supported by the classification of individual features (see chapter 2). Of the less distinctly 'architectural' features, such as probable floor layers, byre drains or pits, even fewer were confidently attributable to any of the house plans. It cannot be denied that these observations are disappointing results considering the significant efforts that went into developing the various approaches towards the review and enrichment of these house plans.

As a matter of comfort, it should be stressed here that the reviewing process itself worked very well. Throughout this final stage of structuring the excavation data, it was evident that if these data had been collected in a more accurate and detailed manner their three-dimensional processing would indeed have provided even better opportunities for further analyses and interpretations of the house plans. The house plans that did make it through are presented and discussed in chapter 3.

2. General observations

2.1. Purpose of this chapter

The previous chapter presents an overview of how settlement archaeology in the north of the Netherlands is usually conducted and how the prevailing approaches relate to the requirements of terp excavations. The current chapter focusses specifically on the differences between this generalised methodology and how the excavation was conducted in Hallum, but also, and more importantly, on how these differences impacted on the identification, documentation and analysis of this site's house remains. Regarding the latter, the current chapter was originally meant to include a listing and justification of any changes made during this project's review of the previously published plans. As the classification of individual features was checked per trench, excavation level and profile (see section 1.4.4), notes were compiled to record these changes. Gradually, however, the list of changes grew longer while the list of house plans shortened and the idea of a complete listing was abandoned.

In its final form, this chapter still highlights the differences and post-excavation consequences of how the fieldwork of Hallum-Hellema was conducted, but it does so in generalised rather than specific terms. In the final section (2.5), some of the most pressing implications of the highlighted matters are identified. This concerns the results of the current project as much as it does the original excavation and the field of settlement archaeology more generally. Bearing in mind that the current report focusses on one excavation only, the implications end with question marks rather than full stops.

2.2. Fieldwork

The three successive excavations at Hallum-Hellema, mentioned briefly in the introduction of this report, were not in principle conducted any differently from the methodological approach to terp excavations set out in section 1.1. Details of the fieldwork approach are discussed in a dedicated section at the start of the excavation report (Tuinstra *et al.*, 2011, pp. 11–18). Excavation levels were both dug and planed with a mechanical excavator, sometimes using a special planing bucket for the latter, aiming to follow the existing incline of the terp mound and deepening each level by approximately 30 cm. During the initial trial excavation (trench 1), the levels were set at circa 40 cm intervals.

Towards the end of each of these three campaigns, one profile was created by planing the near-vertical trench side along one of the excavated area's edges. For the trial excavation (trench 1) this was the northern edge (north profile), for the main and small complementary excavation the eastern edges (east profile and trench 9 profile). It was evident during the main excavation that additional profiles along its north and south edge would have produced more information on the settlement's past development, but this idea appears to have been abandoned in part as a consequence of time pressure (Tuinstra *et al.*, 2011, p. 16). The planing of the profiles was done by hand, using sharp shovels. Because of the height of these profiles and the associated risk of collapse, the relevant trenches were narrowed once or twice as they were deepened, creating stepped sides and horizontal breaks in the profiles.

It was already mentioned in passing that many of the challenges associated with archaeological fieldwork played a part in the excavation of Hallum-Hellema. The cause and effects of time pressure, funding restraints and poor weather conditions, in addition to the methodological difficulties outlined in chapter 1, are referred to throughout the excavation report. In more specific terms, it is stated that both client and excavator desired further works to commence as soon as possible after concluding the trial excavation. This meant that the initial written scheme of investigation (PvE) was not updated, its shortcomings for the formal excavation instead being addressed a brief method statement (Tuinstra *et al.*, 2011, p. 13). It is furthermore stated that the latter campaign was

originally started as a watching brief, although it soon transpired that the density of features and the quality of their preservation were much better than had been anticipated, necessitating the more wholesale archaeological approach instead, “albeit with limitations.” Finally, rain had a significant impact on the fieldwork: “The limited time available lead to the excavation having to be continued during bad weather, which unfortunately limited the observations and did not benefit the quality of the investigation” (Tuinstra *et al.*, 2011, p. 18).

2.3. Site recording

Finds were collected primarily by sight and with a metal detector and recorded per feature context. Feature contours were marked out in the levels by hand and drawn to a 1:50 scale. Selected features were subsequently sectioned to confirm their classification, record relevant characteristics in drawing and collect any finds for further analyses. As already mentioned in some of the previous sections, the whereabouts of the excavation’s original permatrace drawings is unknown and the section drawings had not been digitised, both of which left the current project primarily dependent on the vector drawings of the excavation levels and profiles and little more than a photographic record of the smaller sections.

Digital photographs were taken throughout the process, documenting sections as well as the levels and profiles. Photos of the latter are found to be a very useful source of information for the current project. Feature contours had not been marked out in the profile surfaces when these were photographed, which challenged their comparison with the drawn records. However, having been planed by hand and photographed nearly perpendicular to their surface, the photographic documentation of these profiles is sufficiently clear and complete to visually verify the relevant feature classifications.

By contrast, the surfaces of excavation levels were often blurred and photographed at oblique angles, often from only one end of the trench. This means that not all features have been recorded in these photographs and many that have been cannot be visually reviewed because their texture and colour cannot be made out. Often the marked-out contours provide the only means of confirming exactly which features have been captured in the photographs. The three-dimensional model proved to be a crucial navigational aid in this process, allowing the digital levels to be rotated until their appearance matched that of the levels in the photographs. In several instances, however, this exercise led to the observation that not all drawings accurately represent what could have been observed in the field.

Much like the profiles, the sections have been clearly recorded in photographs and generally support a critical review of the relevant features. Typical of recording sections are the difficulties sun and shade present to the photographer, but the reduced visibility that may result from sharp contrasts was evidently borne in mind in the field; additional photographs with adjusted exposure settings have been taken to mitigate consequences poor lighting may have on the quality of site records. A greater difficulty is presented, again, by the clarity of the excavation levels surrounding the sections. In all but a few cases, poor planing, trampling or spoil from digging has rendered the levels’ surfaces unrecognisable. This, too, led to navigational problems during the current project, which were exacerbated by the fact that the locations of sections had not been included in the digitised field drawings and could therefore only be reconstructed by studying these photographs.

A final remark about the recording of the sections is that only a handful were photographed for each of the excavation levels. The site’s database table for sections has been consulted to assess whether the photographic record was somehow incomplete, but this table only lists sections made during the trial excavation (trench 1). Alternatively, not all sections may have been photographed; something similar is certainly the case with some of the excavation levels, for which indeed no photographs are available, including all of trench 9. The number of photographs listed in the table for images,

however, does correspond to the number of available photographs (N = 426), confirming that the visual record used in the current project is complete but that not all levels and possibly sections were recorded in this way.

2.4. Post-excavation

Section 1.3 boven describes how the decision came about to review the classification of all features prior to (re-attempting to) reconsider the house plans of Hallum-Hellema. An observation that instantly emerged from this review, as the classifications in Table 1 were being marked out, was that a vast majority of features had been classed as one of the various types of 'layer' or indiscriminately labelled as 'stain' or 'unknown'. More specifically: of the total 3352 entries in the deposited features table, 217 are discountable as administrative or (sub-)recent disturbances, but the remaining total of 3135 archaeological classifications include 12 surfacing layers, 72 unknowns, 698 stains, 820 layers and 834 heightening layers (N = 2433; 77.6%). Of the further 717 more diagnostic classifications, 138 have been labelled ash stain, 109 (rubbish) pit and 123 ditch or larger watercourse (N = 370; 11.8%).

Concerning building remains, the remaining 347 classifications include 72 stakes or stake holes, 62 posts or postholes, 1 wall ditch and 1 interior space (N = 136). In addition, 55 (clusters) of individual turves have been recorded, representing parts of either larger turf walls or the build-up or backfill of terp layers, postholes, ditches or pits, albeit that such contexts have not been further specified. A total of 96 turf walls are also listed, but only 35 of these were not originally classified otherwise, for example as foundation trench or, more commonly, as layer or stain. As it transpired, just 191 features (6.1%) of the recorded features have been classed as evidence directly relatable to (possible) buildings – this is an average of 4.6 architectural features for each of the 46 excavation levels and 3 profiles.[5]

This breakdown of the features table makes it evident that the post-excavation process of Hallum-Hellema eventually produced significantly more house plans (N = 27) than the existing site records suggest is feasible. It cannot be asserted from the excavation report, however, how the composition of these house plans was achieved. Method statements, albeit sometimes brief, are included in seven of the book's twelve chapters, not counting the final synthesis, but not in the chapters that deal specifically with building remains: features and structures (Tuinstra and Veldhuis, 2011) and daub fragments (Koopstra, 2011). As already alluded to above, the classification of some features was retrospectively changed to categories associated with house construction. This is particularly true for about two thirds of the listed turf walls, for which such a change has been noted in the feature table, but as further review of the feature classifications clarified when the tree-dimensional model was colour-coded (see section 1.4.4), numerous other classification changes have not been acknowledged in the deposited excavation documentation. No grounds are given for any of these post-excavation changes feature classifications.

2.5. Implications

To conclude this chapter's summary of observations, it must be underlined that the current project's intended review of house plans had not nearly as much archaeological evidence to go on as might be expected from any comparable settlement excavation. This expectation has as much to do with the scale of the fieldwork as with the fact that terp settlements were formed largely through the periodic levelling of bulky building materials, thereby encapsulating significant volumes of the lower parts of demolished buildings. The fact that many sections through such building remains were visible throughout the terp profiles of Hallum-Hellema confirms that this site was no different.

[5] The total excavated area of excavation levels is given as ca 12,000 m^2 and 100 m of profile was documented (Nicolay, 2011, p. 241).

The implications of what has been set out in this chapter are that the excavation of Hallum-Hellema raises concerns about settlement archaeology in the north of the Netherlands more generally. This region has long been on the forefront of archaeological buildings research, within the low countries and arguably in Northwest Europe, but to what avail? How significant is the omission of method statements on the identification and analyses of archaeological building remains? Do the observations specified in this chapter also relate to other large terp excavations? Is the apparent lack of an effective approach to building remains specific to spatially complex terp settlements or is this part of the wider issues the Cultural Heritage Agency of the Netherlands now seeks to address (Huijbers *et al.*, in prep.)? Has the new-found archaeological productivity of the last two decades, referred to in section 1.1, indeed come with "significant downsides to the archaeological recording and interpretation of these important settlement sites?"

3. House plans

3.1. Guidance note

This chapter presents the final house plans for Hallum-Hellema, accompanied by brief descriptions and complementary photographs. All excavation photographs in this report were taken by excavation staff from the former Archaeology Research & Consultancy (ARC) and are now held by the Northern Archaeological Depot (NAD) in Nuis, Groningen.

On individual overview pages, each plan is shown three times in different visual arrangements:

- All-features plan: all house plan and curtilage features (coloured), shown in relation to all other features in the same excavation levels.
- Guidelines plan: only the house plan and curtilage features, with underlying guidelines to show their spatial interpretation.
- Dimensioned plan: only the house plan features, with dimension brackets for quick reference to key measurements.

Features from the excavation level in which the house plans were primarily recorded, are outlined in black. For each feature, trench (T), excavation level (L) and feature (F) numbers are given between brackets (e.g. T2 L3 F430). Any features attributed to the same house plan or its curtilage that were noted in higher or lower excavation levels, have a less conspicuous grey contour. For the meaning of different feature colours, see Table 2 in section 1.4.4. Colour codes for the guidelines are shown in Table 3:

Guidelines	Colour
contours of external walls	RGB 255.0.0
contours of partition walls	RGB 255.127.0
alignment of posts creating aisles	RGB 190.190.190
alignment of structural elements	RGB 0.127.0
contours of boundary ditches	RGB 0.0.255

Table 3. Colour codes for the guidelines, including RGB (Red, Green, Blue) values.

All dimensions are rounded off to the nearest decimetre. Although they are accurate to the three-dimensional model, it should be acknowledged that they can only reflect the dimensions of building remains that have laid buried underground for ca 1000-1500 years. All measurements should therefore be treated with due caution.

3.2. Functional typology

The main characteristics of the house plans are described with a view to developing a functional typology. Such a typology builds on the long-established and widely used practice in the Netherlands of organising archaeological house plans into types, as was briefly referred to in section 1.2. Classifications are not intended as a framework for dating (i.e. not a typo-chronology). Rather, the discerned types provide an essential means of organising large amounts of archaeological evidence, strictly to provide a manageable and reliable foundation for further specialist analyses and interpretation (Nicolay and Postma, 2018; Postma, 2015, pp. 41–59). Viewing typological classifications as a starting point in this way, allows specialist settlement research to concentrate on exactly how past buildings functioned in their various societal contexts.

The brief analyses in this report are based on the reviewed ground plans and any technical details discernible in the excavation drawings and photos. They successively focus on (1) the house plans' typological characteristics, (2) evidence of the buildings' use and (3) the technical details of their

construction. These first three steps of developing a functional should be conducted as objectively as possible; subsequent interpretations consider (4) the overall design of the building and (5) how all of the previous relates to the original buildings' greater context. These last two steps rely more heavily on archaeological models and are therefore more susceptible to changing views.

As a guideline for the description of the house plans, the current project used the following setup and checkpoints:

- Location in excavation: trench; primary excavation level; profile.
- Number in Tuinstra *et al.* (2010): (parts of) structure numbers in original excavation report.
- Functional typology framework:
  1. Typology: primary architectural features; associated architectural features; plan shape and dimensions; classification.
  2. Use of space: interior division; functional features; suggested use.
  3. Building technology: walling materials, dimensions, bonding system.
  4. Structural design: interpretation of superstructure.
  5. Context: plot boundaries; associated features and structures
- Dating: stratigraphic contemporaries, predecessor and successor; settlement phase and dates based on site chronology in original excavation report.

3.3. Future research

Although the current report briefly covers all aspects listed above, developing a functional typology is not itself a research methodology. This approach instead aims to provide a detailed, reliable and structured framework for further and more targeted studies. Such continued research may target the plans' dimensions, for example to further subdivide typological classifications or conduct statistical comparisons of dimensions of house plans. Regarding the use of space, a review of associated finds and sampling results may be informative. Similarly, collected building materials, such as timber, daub fragments, turf samples and thatching materials, would contribute much to any analysis of past building technology. Unfortunately, such studies fall outside the scope of this project, which is preoccupied with composing and describing only the house plans, but feature numbers are provided for future reference.

Further investigation may also focus more on the contextualisation of the house plans, which is what a functional typology ultimately aims to accommodate. Some first remarks about the curtilage of the buildings have been included in the descriptions and concluding chapter; further contextualisation would need to focus on the site's wider spatial development, primarily by assessing how the (vertical and horizontal) positions of buildings relate to their cross sections or associated (dirty) occupation layers in the excavation profiles. Throughout the current project, the published stratigraphy has been referred to and occasionally improved to better correspond to the revised house plans. However, a more definitive statement on the settlements' development through time requires a more dedicated approach to the matter, also taking into consideration the available dating evidence. All the above will contribute greatly to explaining the settlement development of Hallum-Hellema in terms of the more general economic, socio-political and ideological changes of the time.

3.4. House plans of the northern plots

Structure 2 – Turf byre with work area

Location in excavation: trench 5-6, level 8; east profile.

Number in Tuinstra *et al.* (2010): structure 1.

Functional typology framework:

1. Typology: primary architectural features are two turf walls – southwest wall (T6 L8 F328 and F336) and northeast wall (T6 L8 F337, probably also F347-348).
   Four posts (T5 L8 part of F4) were recorded in the most southern part of the plan; three form a crude line just over 80 cm from the interior wall but are irregularly spaced (2.23 m and 0.78 m apart) and the middle may have been the fill of a later pit (T5 L7 F311) in the same location; the evidence is too scarce to suggest multiple aisles in the interior.
   The building was at least 14.7 m long and 4 m wide internally; classed as Leens A type.

2. Use of space: no indications for an interior division. A presumable byre drain (T6 L8 F346, Fig. STR2-1) was found in the lower northwest end of the building, ca 1.5 m from the wall face, giving an asymmetrical byre interior layout.
   A small patch of burnt material (T6 L8 F333, Fig. STR2-4) undercuts the northwest wall. The east profile shows a burn layer (F1296, Fig. STR2-2) in the higher southeast end of the building, possibly indicating a work area.
   Suggested use: byre with work area.

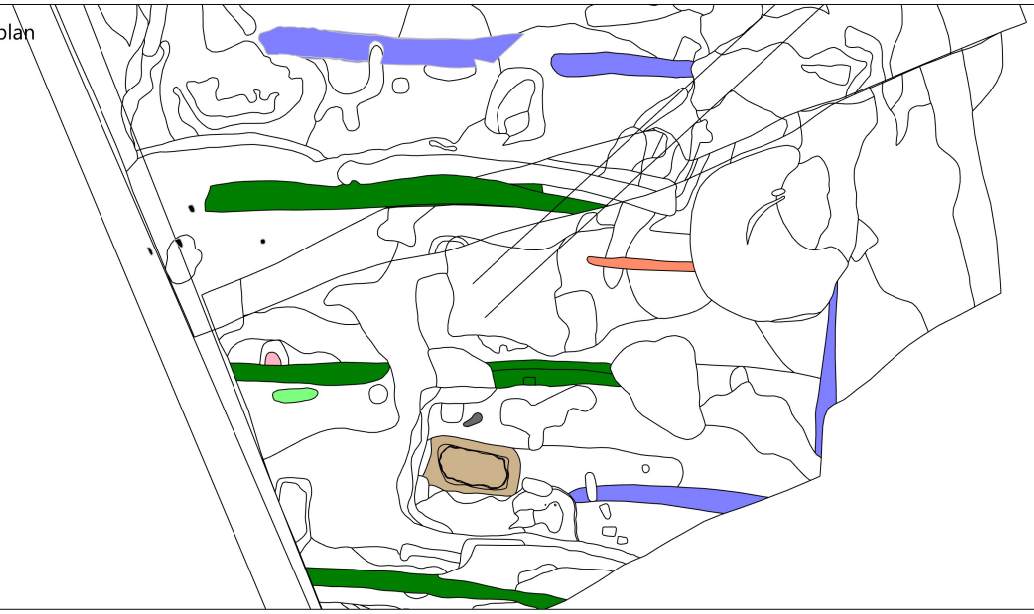
3. Building technology: the section of the southeast wall (Fig. STR2-3) shows two courses, with turves ca 6 cm thick, 88 cm long, used as headers; on the southeast side, a fillet was used for levelling prior to applying the second course; the inner wall face is distinctly vertical. The section of the northeast wall shows only the lowest part of a first course, apparently with half-length headers (ca 44 cm; Fig. STR2-4); only the southern row of headers was recognised in the excavation level.

4. Structural design (based on Postma 2015): interpreted as a single-aisled building with load-bearing turf walls.

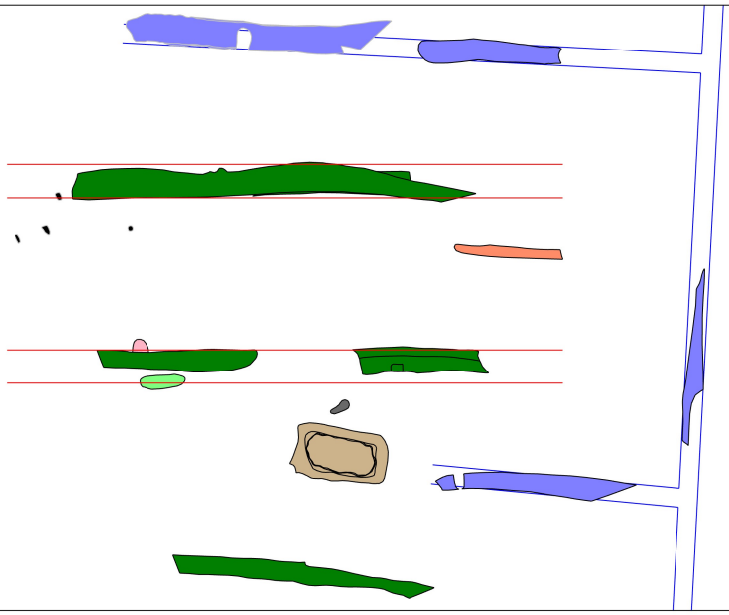
5. Context: boundary ditches (Fig. STR2-6) to the northeast (T6 L8 371/373) and southwest (T5 L7 F297) side at respectively 2.5 m and 2.9 m distance, draining into a third (unconfirmed) ditch to the west (T6 L8 F416); apparent plot width is 11.3 m.
   A rectangular, steep-sided pit (T6 L8 F360, Fig. STR2-5) with adjacent posthole (T6 L8 F354) is shown to the northeast of the building.

Dating: contemporary with structures 3 and 4; no known predecessor; succeeded by structure 5. Attributed to phase V, Migration period, 5th-6th centuries (Table 4).

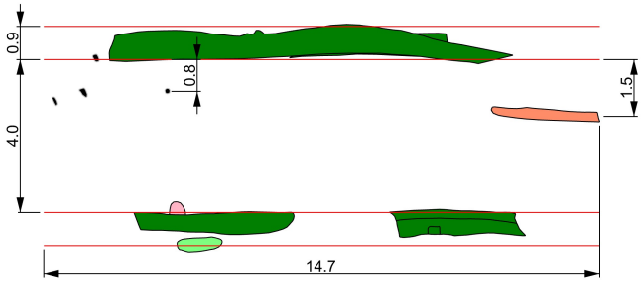
All-features plan



Guideline plan



Dimensioned plan



Hallum-Hellema Structure 2 (and 3)

10 m scale 1:200

Fig. STR2-1. Trench 6, level 8, showing northeast wall (T6 L8 F337), boundary ditch (T6 L8 371/373) and presumed byre drain (T6 L8 F346).

Fig. STR2-2. East profile, showing approximate section of structure 2.

Fig. STR2-3. Section through southwest wall (T6 L8 F336).

Fig. STR2-4. Section of northeast wall (T6 L8 F337) and burnt patch (T6 L8 F333).

Fig. STR2-5. Section through northeast yard, with pit (T6 L8 F360) and post (T6 L8 F354), cutting into southwest wall of structure 3 (right; T6 L8 F281).

Fig. STR2-6. Sections through northeast (left; T6 L8 F371/373) and southwest (right; T5 L7 F297) boundary ditches.

Structure 3 – Turf building

Location in excavation: trench 6, level 8; east profile.

Number in Tuinstra *et al.* (2010): structure 2.

Functional typology framework:

1. Typology: primary architectural feature is a single section of turf wall (T6 L8 F281; see most northwestern feature in plan of structure 2; see Fig. STR2-5 for partial section).

2. Use of space: turf byre?

3. Building technology: -

4. Structural design: -

5. Context: on plot adjacent to structure 2.

Dating: contemporary with structures 2 and 4; no known predecessor; succeeded by structure 6. Attributed to phase V, Migration period, 5th-6th centuries (Table 4).

Fig. STR3-1. East profile, showing approximate section of structure 3.

Structure 4 – Sunken feature building

Location in excavation: trench 5, level 8.

Number in Tuinstra *et al.* (2010): -

Functional typology framework:

1. Typology: primary architectural features are a rectangular feature (T5 L8 F385) and two postholes (T5 L8 F383-384); the presumed pit was not recognised as possible sunken-feature building during excavation and appears not to have been sectioned. From the level photographs, the linear feature (T5 L8 F381) that cuts the pit may have been a turf wall.
   Apparent interior dimensions are 2.1 x 3.3 m.
   Classed as possible sunken-feature building.

2. Use of space: the two posts, set 1.9 m apart, were not well aligned with the northeast wall, suggesting they may not have been structural – loom?
   Suggested use: workspace – weaving hut?

3. Building technology: appears to have been built into a southern slope of the terp, leaving only lower part of the southwest wall visible in the excavation level – compare Wijnaldum-Tjitsma sunken hut 4 (Gerrets and Koning, 1999, p. 113 Figure 31).

4. Structural design: -

5. Context: located in lower corner of the plot adjacent to structure 2, but no other building remains were recorded on the same plot.

Dating: contemporary with structures 2 and 3; no known predecessor or successor. Attributed to phase V, Migration period, 5th-6th centuries (Table 4).

Fig. STR4-1. Trench 5, level 8, looking northwest.

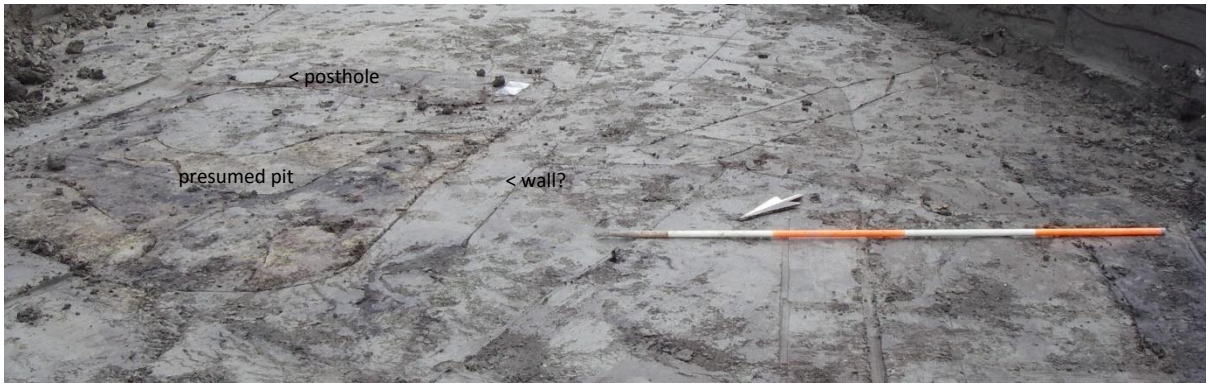
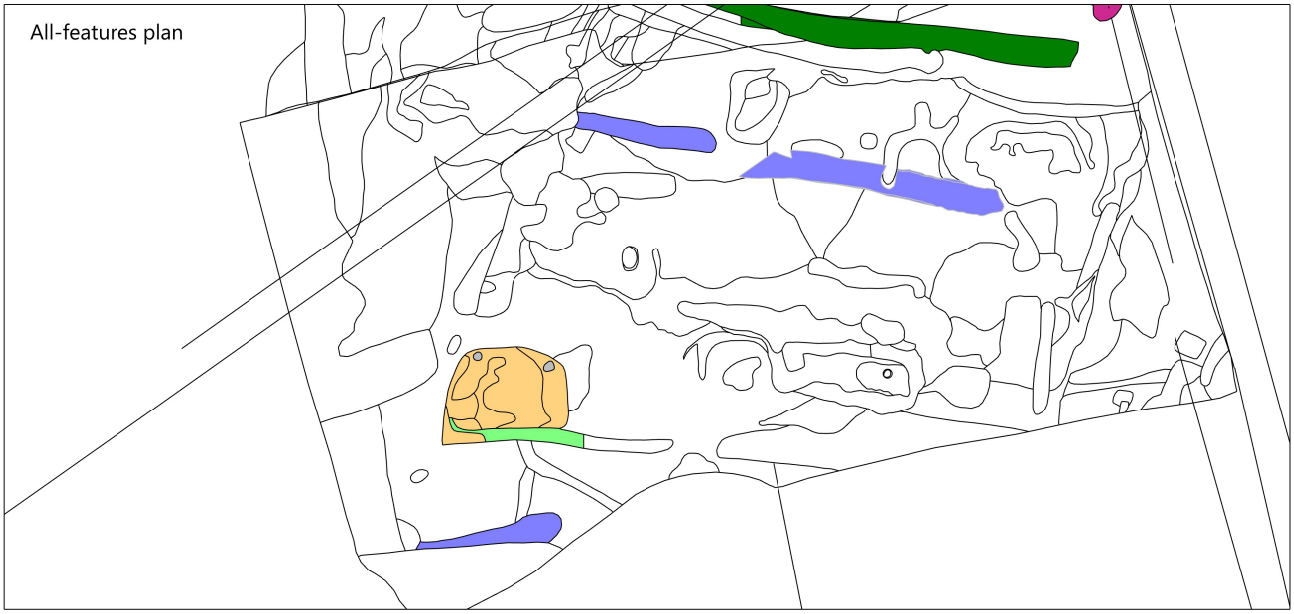
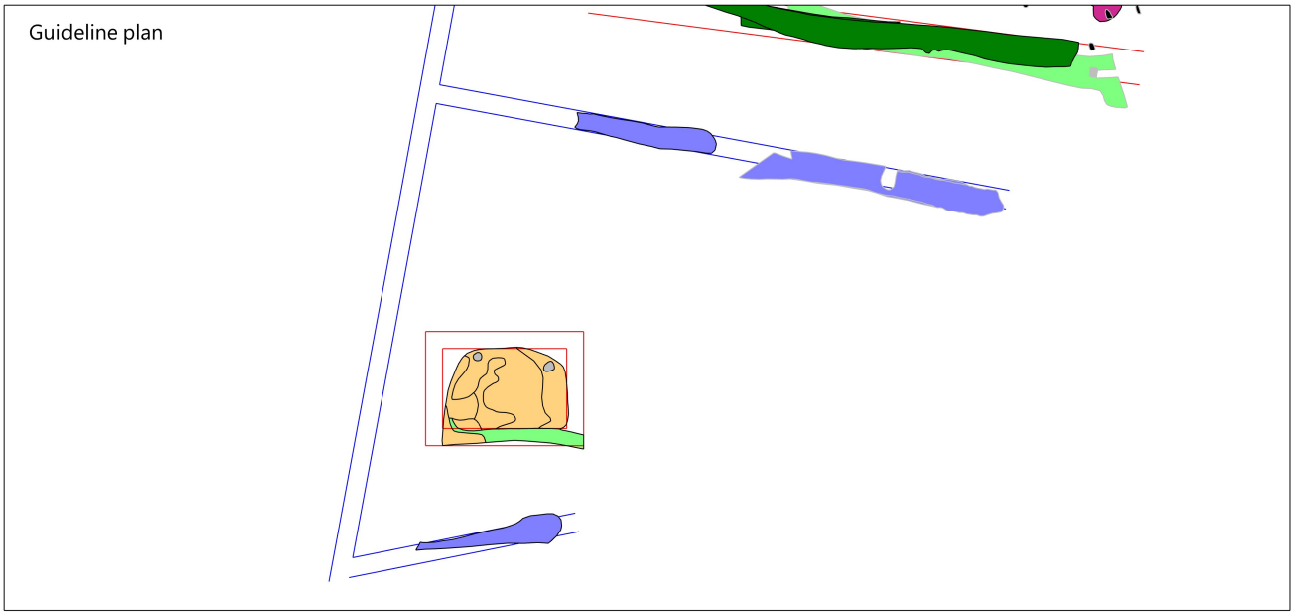


Fig. STR4-2. Trench 5, level 8, showing the presumed sunken feature (T5 L8 F385), one posthole (T5 L8 F383) and the assumed turf wall (T5 L8 F381).

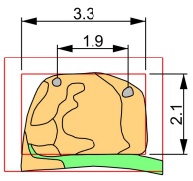
All-features plan



Guideline plan



Dimensioned plan



Hallum-Hellema Structure 4

10 m scale 1:200

Structure 5 – Turf byre with loft

Location in excavation: trench 1 and 5, level 7; north profile.

Number in Tuinstra *et al.* (2010): structures 6 and 10.

Functional typology framework:

1. Typology: primary architectural features are partial turf walls from all four sides – northwest short wall (T1 L7 F155), southwest long wall (T5 L7 F237, T5 L5 F140 and probably T5 L7 F264), northeast long wall (T1 L7 F155) and southeast short wall (T5 L5 F224).
   Furthermore, the locations of three posts were recorded in the building's interior; the southwestern (T5 L7 F262) as apparent removal pit (Fig. STR5-8), the northernmost on two levels (T1 L5 F133 and T1 L7 F149) and the eastern (T5 L5 F215) is unconfirmed but likely. Another feature (T5 L7 F256), recorded as unspecified pit in the eastern corner of the interior, is presumed to indicate a fourth post.
   Two postholes (T5 L5 F135-136) in the southeast wall indicate the position of doorposts, seen in section to stand ca 60 cm apart (Fig. STR5-7); a dark brown spot in the excavation level suggests that the stump of the southernmost of these (with diameter of ca 8-10 cm) decayed in place, while the section suggests the opposite post was dug out.
   Interior dimensions are 16 x 4.5 m; three-aisled arrangement along full length of building, with 2.1 m wide middle aisle and 1.2-1.3 m wide side-aisles; seven ca 1.8 m long bays plus half bays at either end; classed as Leens A type.

2. Use of space: the southeast wall was originally drawn with a small perpendicular appendix, possibly suggesting an interior partition wall, but this is not borne out by the level photograph (Fig. STR5-2). A large feature (T5 L7 F260) in the building's interior is shown in section to consist of turf infill (Fig. STR5-4), raising the floor for a new period of use; its fingered southeastern contour in plan may reflect a byre drain in the underlying (darker) floor layer along the southwest wall.
   The opening between the doorposts in the southeast wall shows turf infill (same as F260 in interior?) as the floor level was intentionally raised with 'clean' turf.
   Suggested use: byre and loft (see structural design), presumably a work area at the higher end.

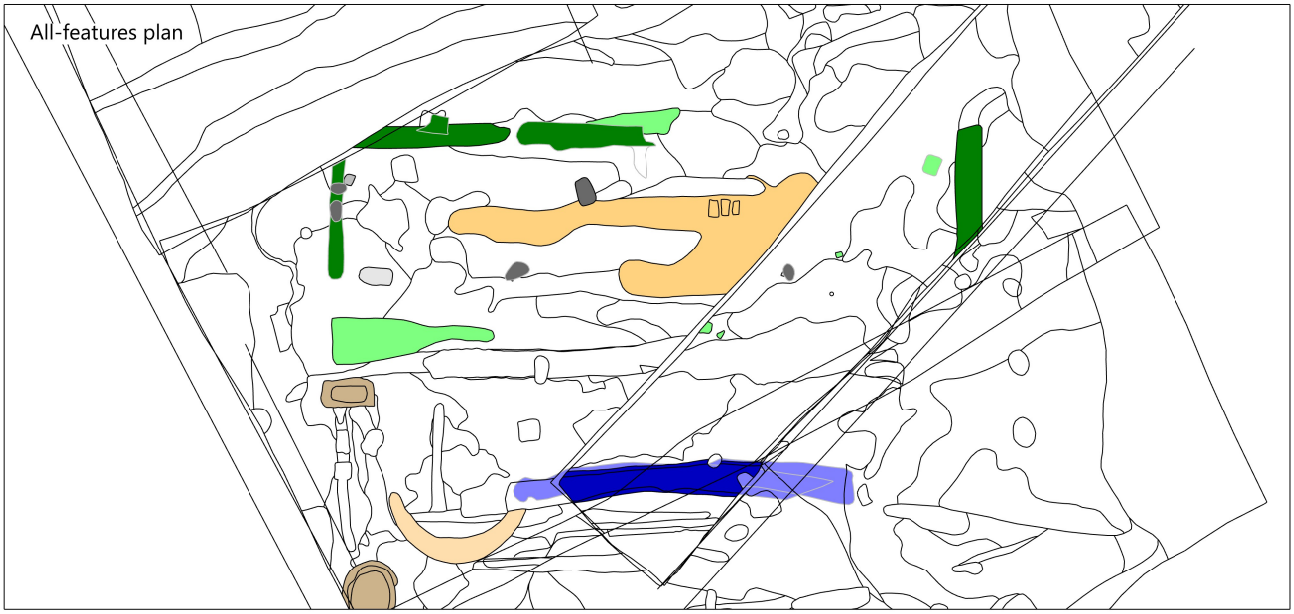
3. Building technology: the section of the southwest wall (Fig. STR5-5) is indistinct but shows a clear header of at least 60 cm long at the top and fainter traces of a wider turf wall with vertical interior wall face underneath; the long walls are provisionally drawn at 90 cm width. The width of the northwest short wall in plan corresponds to its width in the north profile, indicating it was only 60 cm thick, with vertical wall faces (Fig. STR5-3).

4. Structural design (based on Postma 2015): three-aisled building with roof-bearing turf walls and loft-supporting interior posts. The apparent half bays and relatively thin short walls may indicate gabled ends with lighter (timber) top sections.

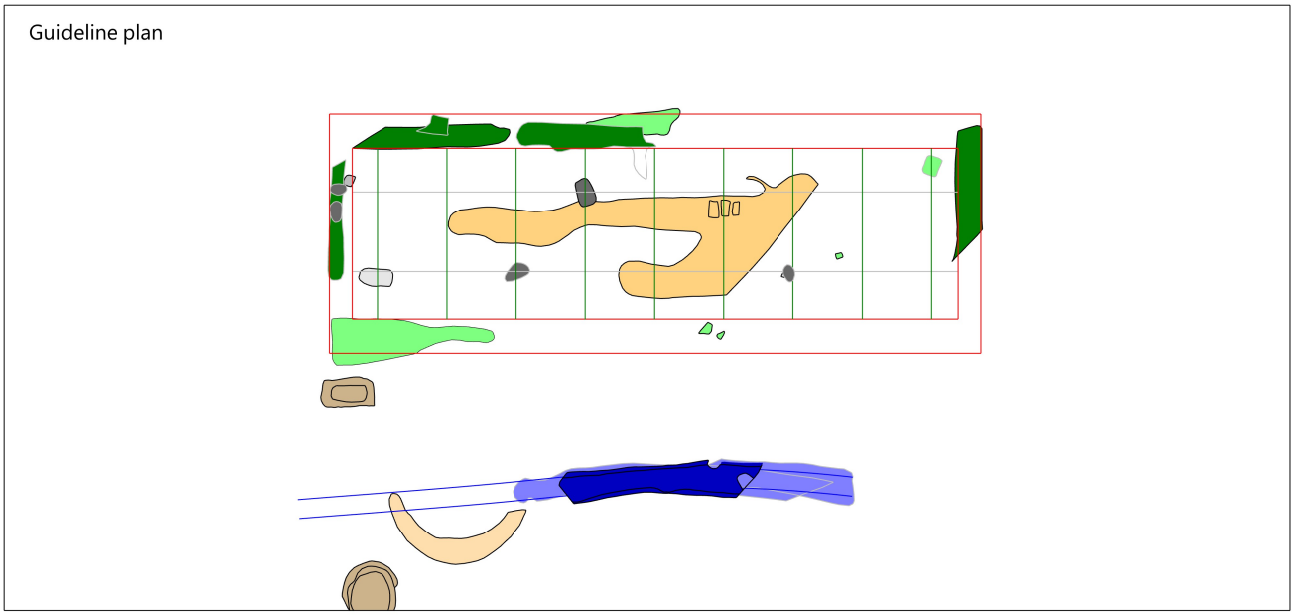
5. Context: a refuse pit (T5 L7 255) was recorded outside the northeast corner, shown in cross section with a distinct white-grey ash layer (Fig. STR5-9). A crescent-shaped feature north of this pit is similar to later ring ditches interpreted as cornstack enclosures (see structure 8). For the boundary ditch, see structure 6.

Dating: contemporary with structures 6 and latterly 7 on the northern plots; replaces structure 2; no known successor other than structure 7. Attributed to phase VI, Merovingian period, 6th-7th centuries (Table 4).

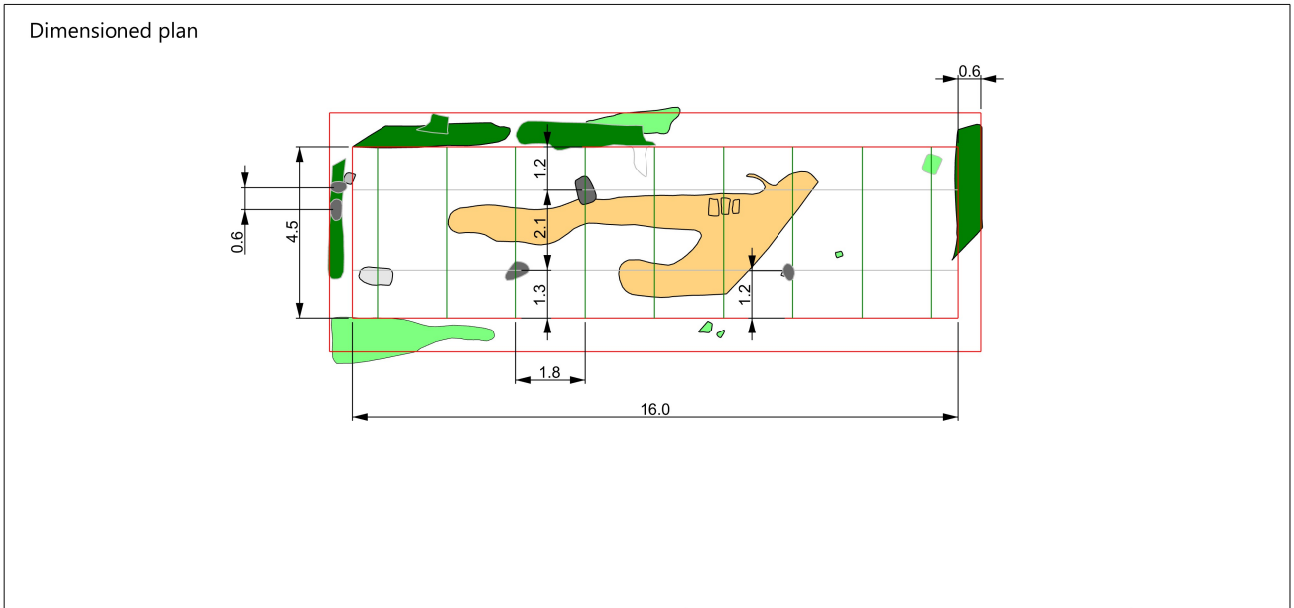
All-features plan



Guideline plan



Dimensioned plan



Hallum-Hellema Structure 5

10 m scale 1:200

Fig. STR5-1. Trench 5, level 7, showing southwest wall (T5 L7 F237), northeast wall (T5 L7 F254) and post pit (T5 L7 F262).

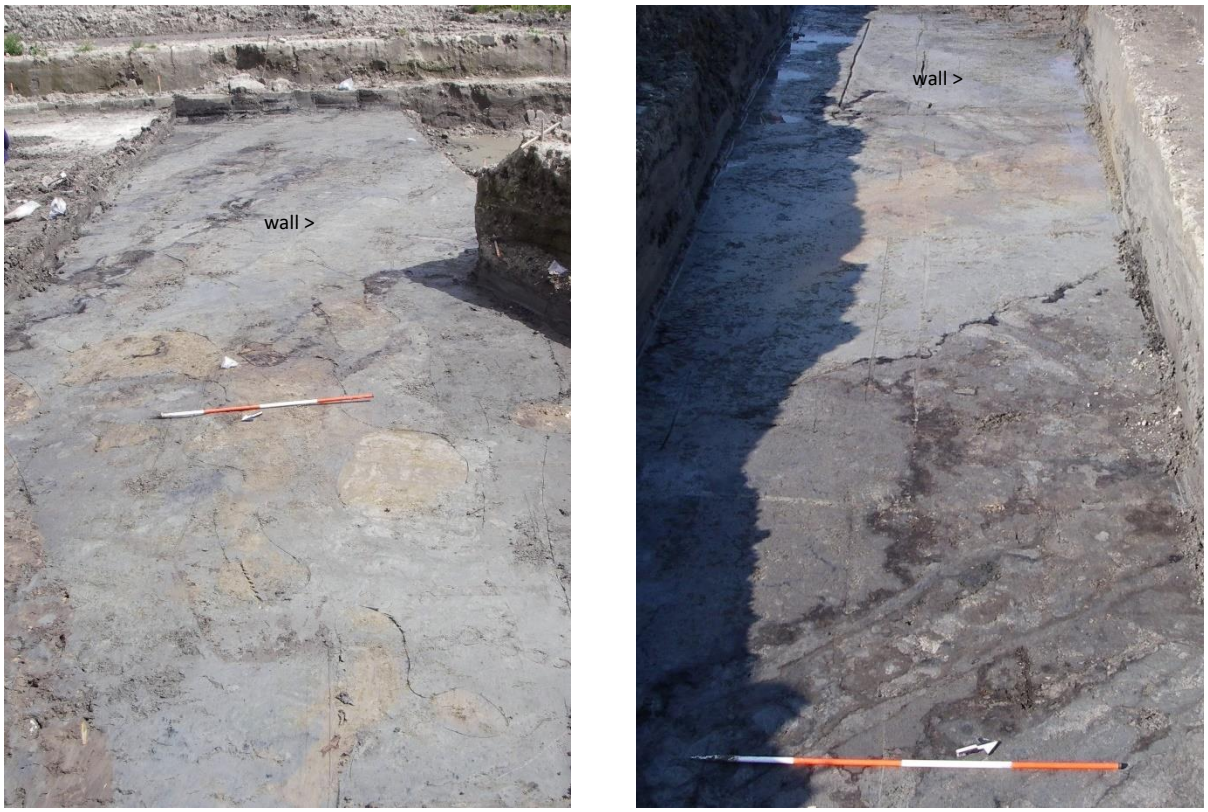


Fig. STR5-2. Trench 5, level 5 (left), showing southwest wall (T5 L5 F140), and trench 1, level 7 (right), showing northeast wall (T1 L7 F155).

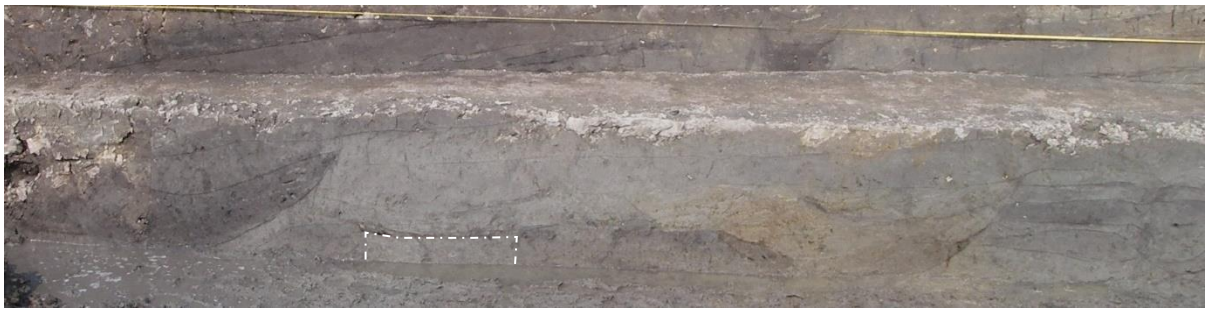


Fig. STR5-3. North profile, showing cross section of northeast wall (T1 L7 F155).

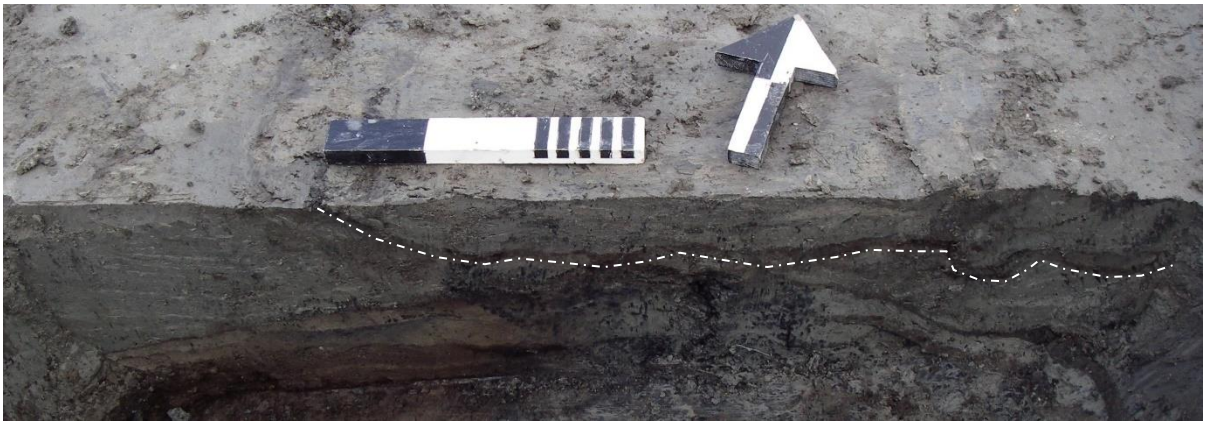


Fig. STR5-4. Section of interior infill (T5 L7 F260), overlying turf wall of earlier but unrecorded structure to the left.

Fig. STR5-5. Section of southwest wall (T5 L5 F140), showing harder to discern courses below and to the left.

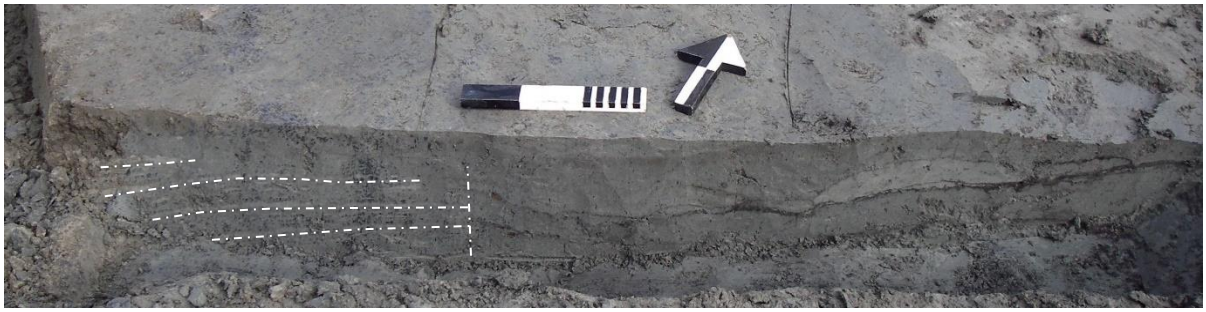


Fig. STR5-6. Partial section of southwest wall at lower level (T5 L7 F237).

Fig. STR5-7. Longitudinal section of southeast wall (T5 L5 F224) and pits of doorposts (T5 L5 F135-136).

Fig. STR5-8. Section of post-removal pit (T5 L7 F262) along southwest wall.

Fig. STR5-9. Section of refuse pit (T5 L7 F255).

Structure 6 – Turf byre with work area

Location in excavation: trench 6, level 5; east profile.

Number in Tuinstra *et al.* (2010): structures 1 and 2.

Functional typology framework:

1. Typology: primary architectural features are two sections of opposite turf walls – southwest long wall (T6 L5 F184, probably also T6 L7 F244/248) and northeast long wall (T6 L7 F281). A single post (T6 L7 F242) in line with the southwest wall may indicate an entrance but this cannot be confirmed.
   The building was over 11.4 long and 4 m wide internally; classed as Leens A type.

2. Use of space: an apparent central fireplace (F1325) is visible in the east profile (Fig. STR6-1). Suggested use: byre with work area at its higher east end.

3. Building technology: the section of the southwest wall shows a wall thickness of circa 88 cm. Faint discontinuations in the salt-march layers in the turves suggest the first course was laid as four rows of headers and the second course with single headers.

4. Structural design: -

5. Context: a circa 75 cm wide ditch (T1 L7 F139/140) divides the plot from that of structure 5 to its southwest, visible in section in the north profile (F985, F991) and recorded again in a lower excavation level (T6 L8 F330; T5 L8 F331). A circular pit (T5 L7 F311) was recorded as burnt layer in the level below (T6 L8 F334) but not sectioned. A crescent-shaped feature north of this pit is similar to later ring ditches interpreted as cornstack enclosures (see structure 8).

Dating: contemporary with structures 5 and latterly 7 on the northern plots; replaces structure 3; no known successor. Attributed to phase VI, Merovingian period, 6th-7th centuries (Table 4).

Fig. STR6-1. East profile, showing approximate section through structure 6.

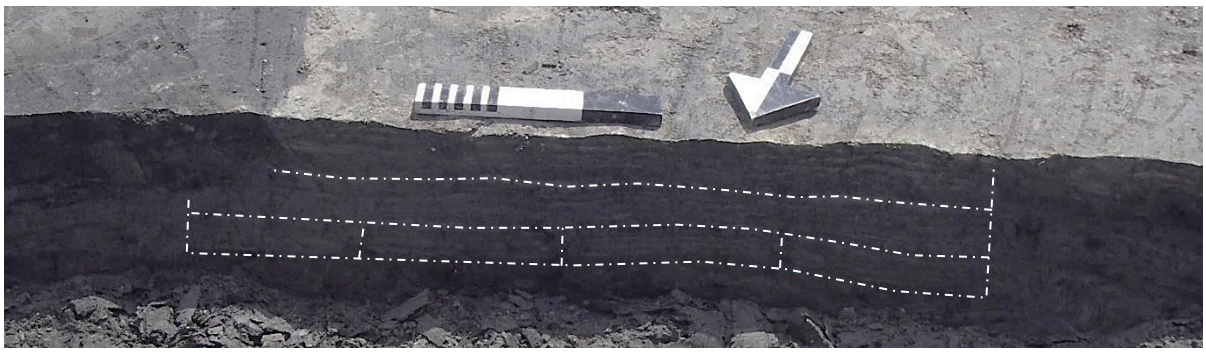
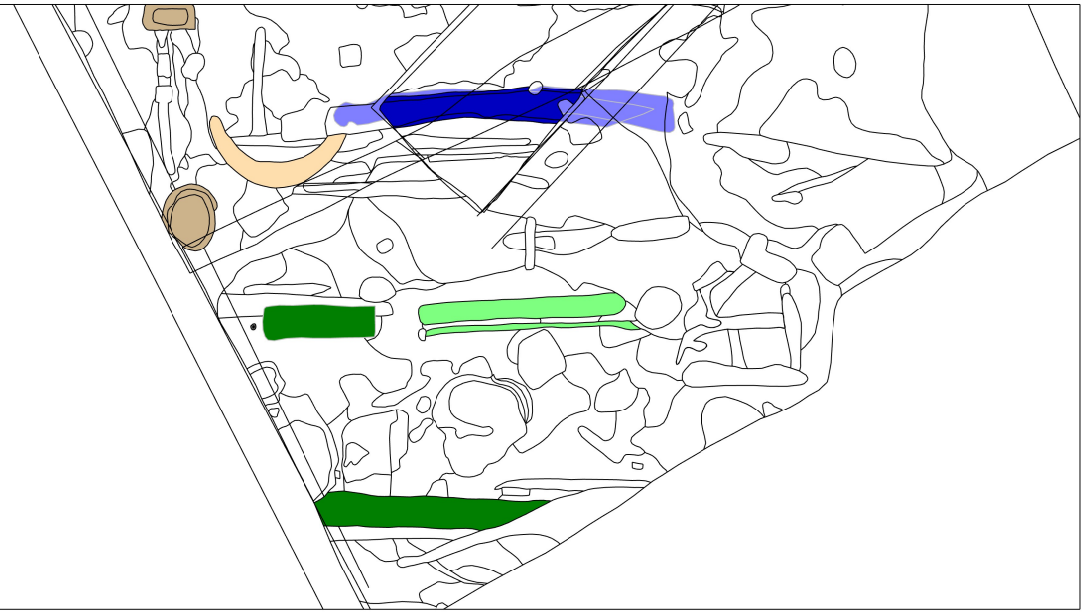
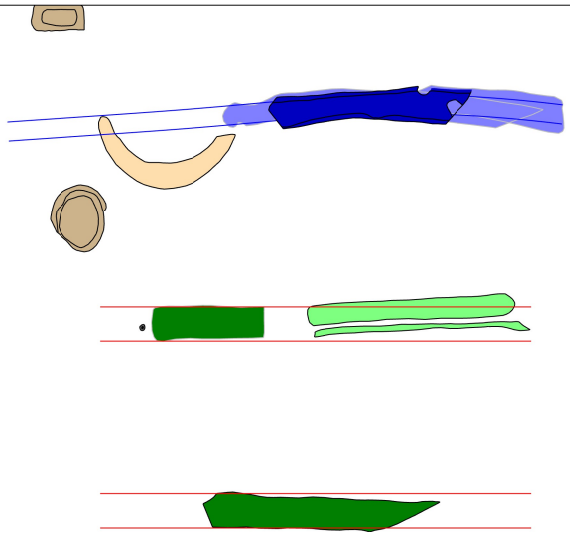


Fig. STR6-2. Section of southwest wall (trench 6, level 5, F184).

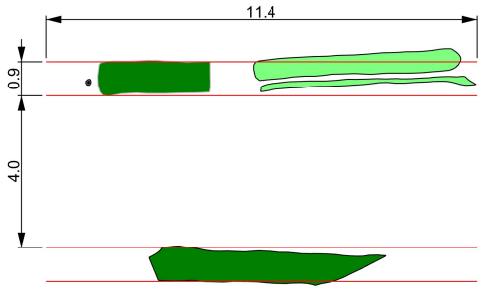
All-features plan



Guideline plan



Dimensioned plan



Hallum-Hellema Structure 6

10 m scale 1:200

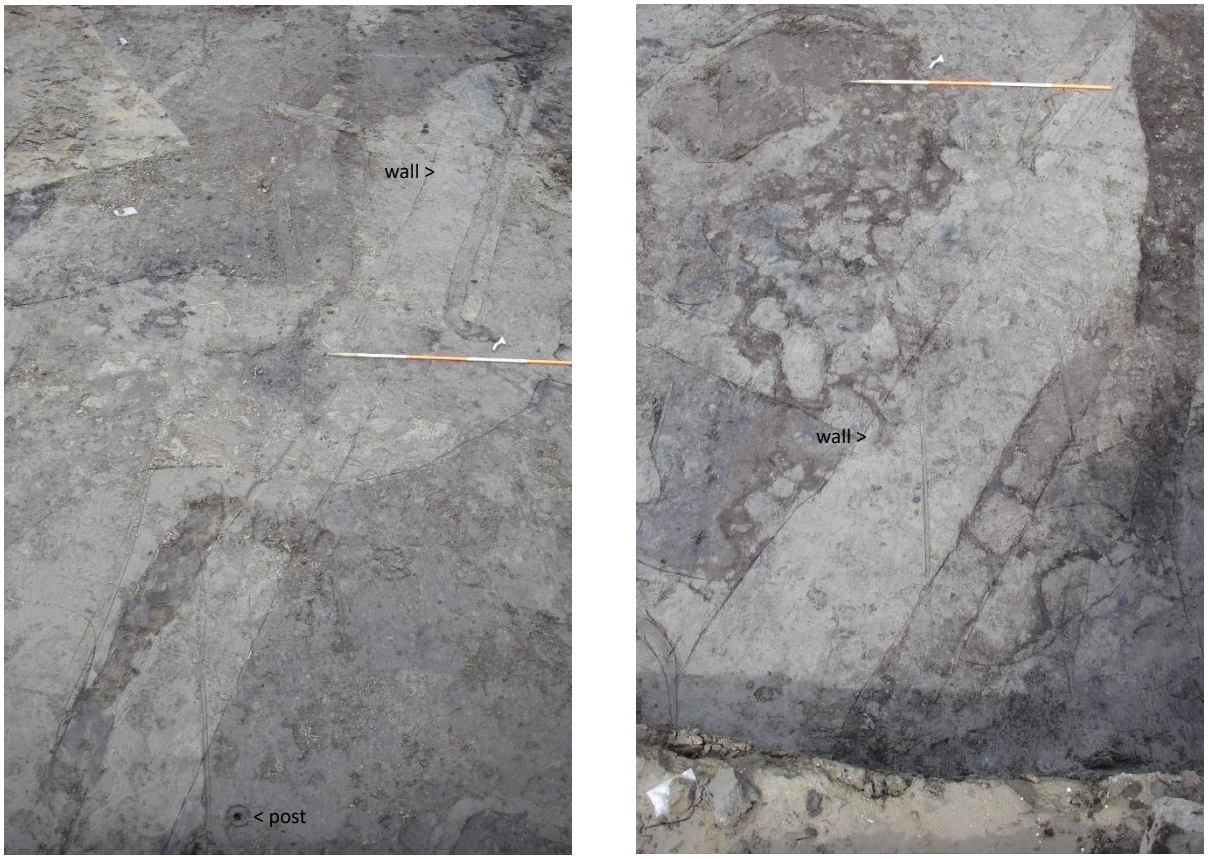


Fig. STR6-3. Trench 6, level 7; left showing post (T6 L7 F242) and probable lower part of the southwest wall (T6 L7 F244/248); right showing northeast wall (T6 L7 F281).

Fig. STR6-4. North profile, showing angled section through boundary ditch (F985/991; T1 L7 F139/140 in plan) between structures 5 and 6.

Structure 7 – Timber byre with work area and loft

Location in excavation: trench 1, 5-6, level 5; north profile.

Number in Tuinstra *et al.* (2010): structures 11 and 23.

Functional typology framework:

1. Typology: primary architectural features are five postholes (T1 L5 F111, F115, F119 and F121-F122) recorded in the northwest end and a probable sixth posthole to the southeast, recorded in two levels (T5 L5 F209 and T5 L7 F209).
   The lower excavation level shows three longitudinal features, here interpreted as wall ditches – southeast short wall (T5 L7 F285), recorded as foundation ditch during excavation; unconfirmed interior partition (T5 L7 F295), originally recorded as heightening layer; and northeast long wall (T6 L7 F232), initially recorded as unspecified ditch. No cross sections are available to confirm the interpretation of these wall features, but the unrecorded southwest long wall can be discerned in the north profile (Fig. STR7-2).
   Two apparent postholes (T5 L7 F283-284) in line with the southeast wall were recorded as (backfill) turves during excavation but are appear similar in plan as the doors posts of structure 5. The presumed door posts of structure 7 stood ca 80 cm apart.
   Interior dimensions were 4.5 x 12.8 m, assuming the same number of bays as the adjacent structure 5; central aisle was 1.7 m wide and side aisles 1.4 m, width an average bay size of 1.4 m.
   Not classifiable as a currently known type, but regarded as a timber rendition of the Leens A type.

2. Use of space: the presumed partition wall fits well with the projected bays, leaving a probable work area of one and a half bay (2.2 m internally) in the southeast end.
   Suggested use: byre and loft (see structural design), with partitioned work area.

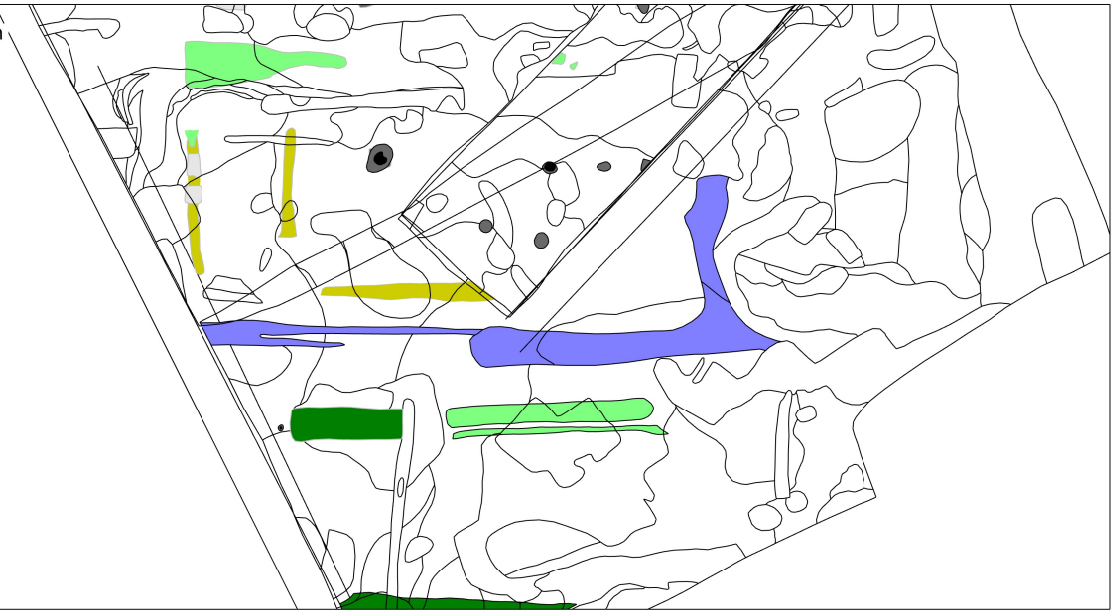
3. Building technology: wall ditches are thought to have contained timber wall elements, such as prefabricated wattle panels, but no details were recorded to be specific on their construction.

4. Structural design (partly based on Postma 2015): interpreted as a building with roof-supporting timber walls and loft-supporting interior posts. Half bays may suggest gabled ends.

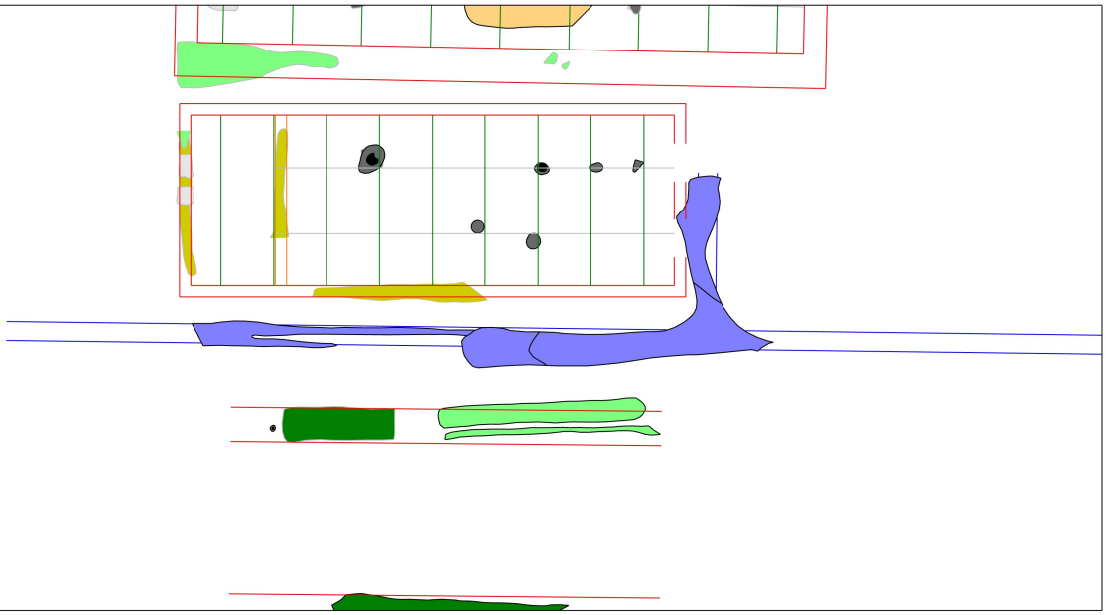
5. Context: the building was constructed in the hollow between structures 5 and 6, acknowledging the continued presence of structure 5 in the alignment of their southwest short walls. The earlier boundary ditch (see structure 6) was moved northeast to accommodate the addition of structure 7 and drain the narrow area between the new building and structure 6 (T6 L5 F162/190; Fig. STR7-5).

Dating: contemporary with structures 5 and 6 on the northern plots, albeit a later addition; no direct predecessor or (known) successor. Attributed to phase VII, Merovingian period, 6th-7th centuries (Table 4).

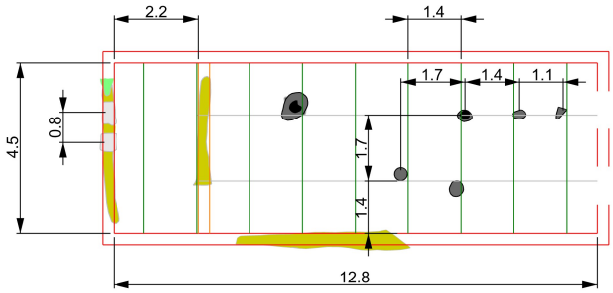
All-features plan



Guideline plan



Dimensioned plan



Hallum-Hellema Structure 7

10 m scale 1:200

Fig. STR7-1. Trench 1, level 5, showing five postholes in two parallel rows.

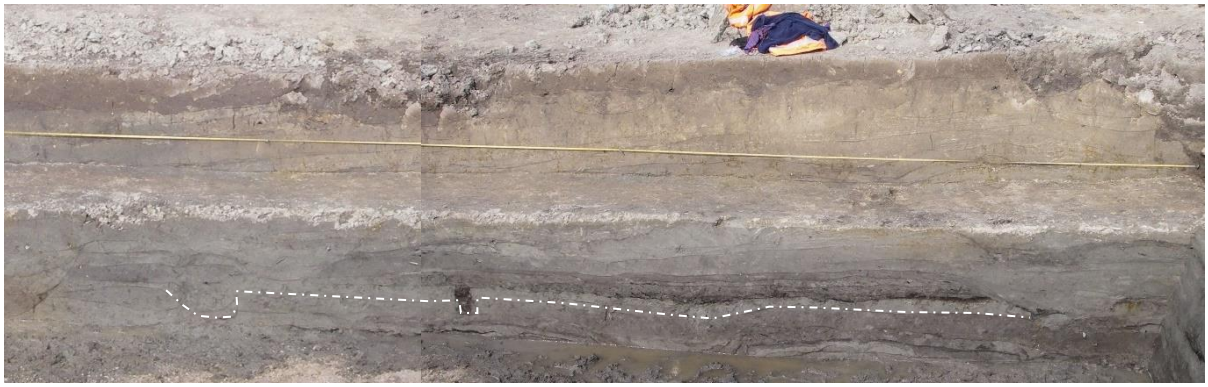


Fig. STR7-2. North profile, showing cross section of structure 7 with ditch of southwest wall and interior post (T1 L5 F122).

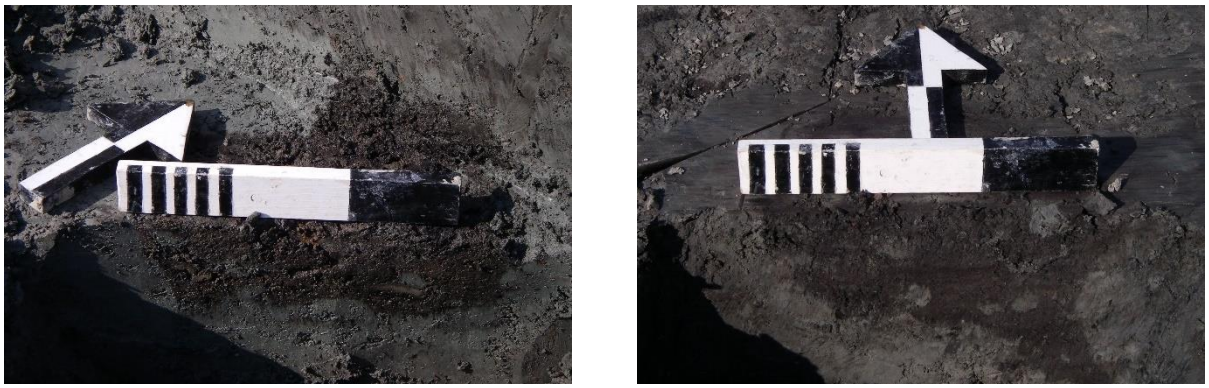


Fig. STR7-3. Sections of postholes in trench 1, level 5: F122 (left) and F111 (right).

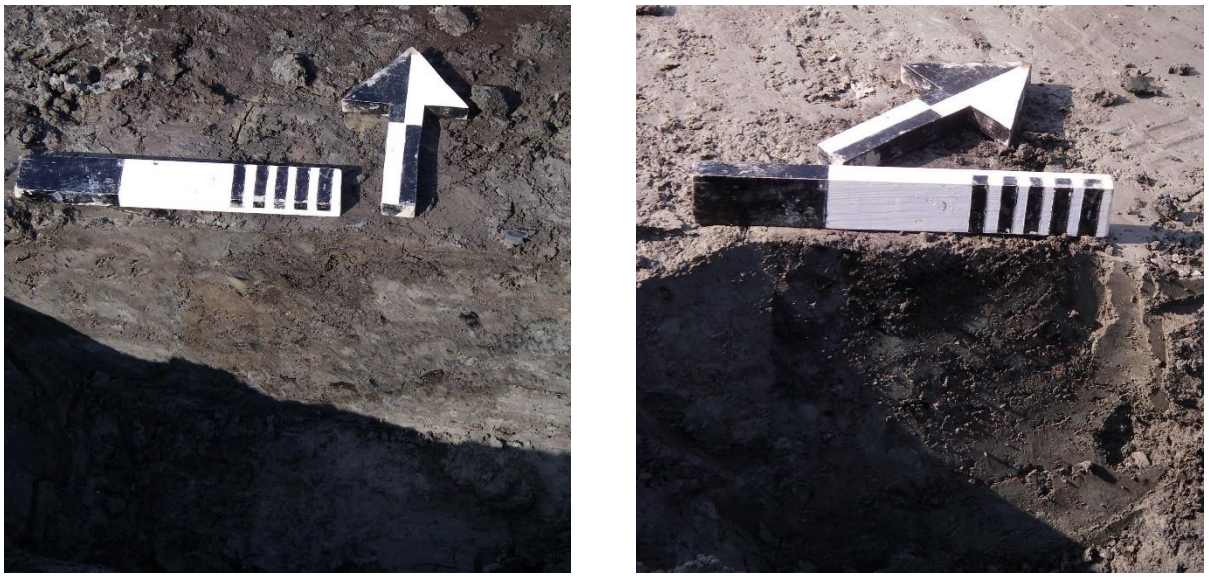


Fig. STR7-4. Sections of postholes in trench 1, level 5: F119 (left) and F121 (right).

Fig. STR7-5. Section of the relocated ditch (T6 L5 F162/190), in between structures 6 and 7.

Structure 8 – Timber dwelling

Location in excavation: trench 1, 5 and 6, level 4; north profile.

Number in Tuinstra *et al.* (2010): structure 14.

Functional typology framework:

1. Typology: primary architectural features are exterior wall ditches on three sides of the building – southwest long wall (T6 L4 F96; Fig. STR8-2), southeast short wall (T6 L4 F93-94) and northeast long wall (T6 L4 F97/119). Two narrower partition walls were also recorded (T6 L4 F98-99). Tentatively dividing the middle room in four bays of 1.8 m each provides the basis for a likely structural arrangement for the whole building, giving three full bays in the higher southeast end and perhaps the same number in the southwest end. The projected guidelines furthermore suggest that an undefined pit (T6 L4 F137; Fig. STR8-1) and stain (6 4 143) mark the positions of posts along the inside of the northeast long wall.
   Interior length was at least 13.5 but is interpreted here as ca 18.2 m; interior width 6.2, narrowing to 5.2 m in the last two bays.
   Not classifiable as a currently known type but showing similarities with Odoorn C' (single aisled and narrowed end), Zelhem type (interior width great than 6 m) and Gasselte A (no exterior posts).

2. Use of space: the two rooms at the southeast end were 5.2 m and 7.1 m long internally, the latter including a layer of burnt material (T6 L4 F120; Fig. STR8-4), possibly indicating a fireplace. No evidence of a byre area can be discerned, although little of the lower end of the building was excavated (see also structure 16).
   Suggested use: dwelling, presumably without byre area – with central hall?

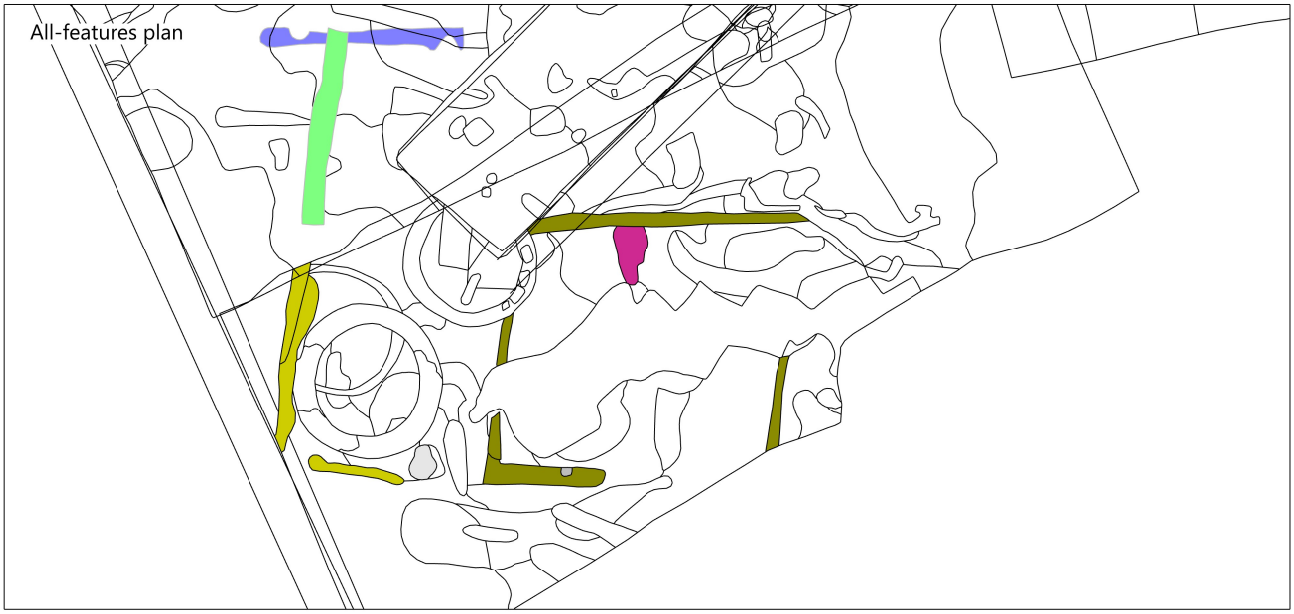
3. Building technology: posts appear to have been placed along the inside of the wall ditches, as suggested in plan (discussed above) and in a longitudinal section of the northwest partition wall (T6 L4 F99; Fig. STR8-3). No evidence of walling materials can be recognised in plan or section.

4. Structural design (based on Postma 2015): single-aisled building with cuppills (cruck-like trusses) placed along the inside of the (wattle?) walls. The cuppills were placed at an angle (seen from above) for stability along the length of the building.

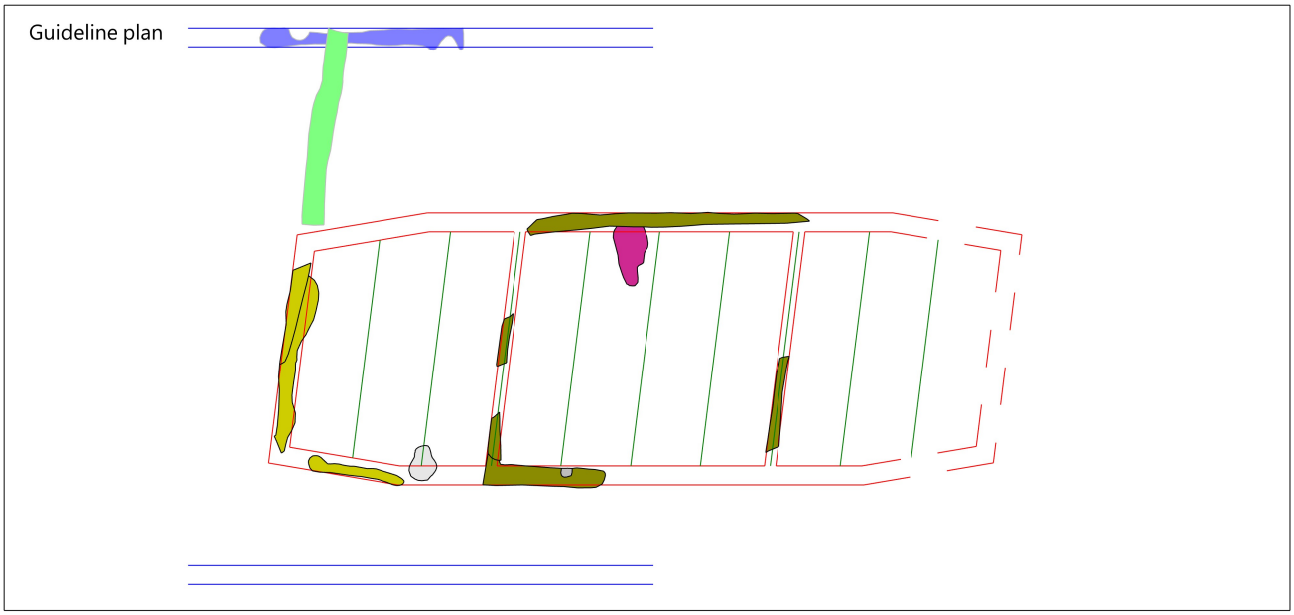
5. Context: a boundary ditch was recorded in a lower level to the south (T5 L5 F204; Fig. STR8-5), while its northeastern counterpart is recognisable in the east profile (F1398-1399), giving a plot width of 14.2 m. The plot was later widened towards the southwest and an apparent turf wall (T5 L3 F55; Fig. STR8-6) built across the old boundary ditch in alignment with the building's southeast short wall.
   The building overlies structures 6-7, but ring ditches (T6 L4 F95, F112 and F157; Fig. STR8-1) bear evidence of an intermittent period in which the area was used as farm yard.

Dating: no contemporary buildings are known from the northern plot; no known predecessor or successor but overlain by structure 9. Attributed to phase VIII, Carolingian period, 8th-9th centuries (Table 4).

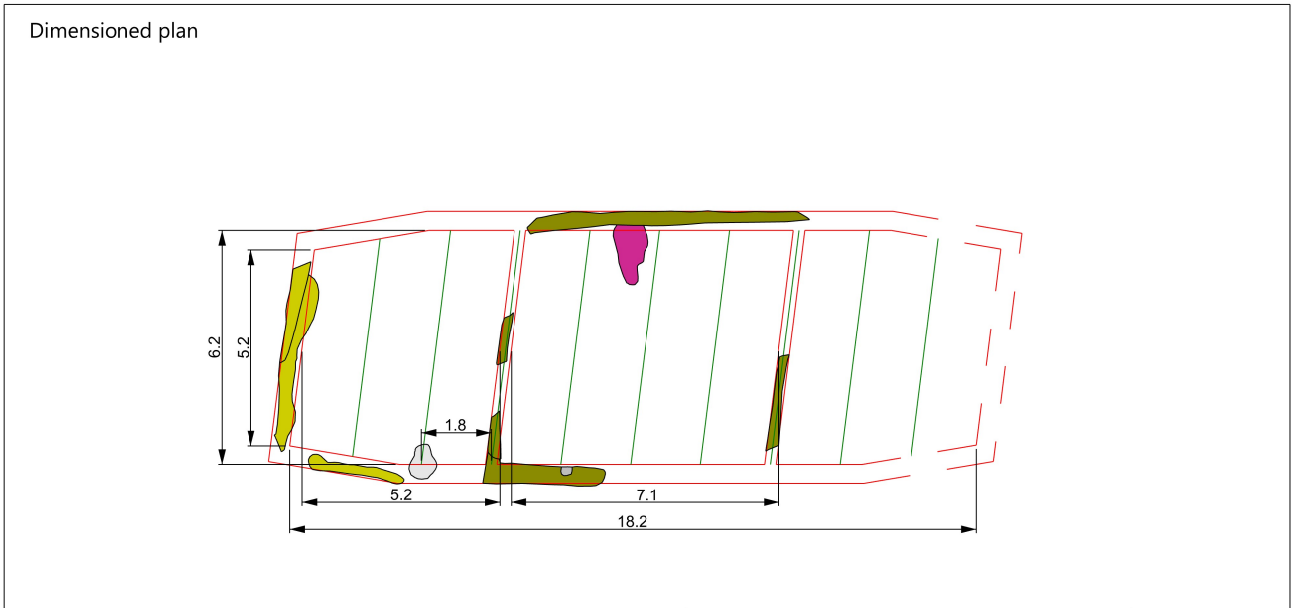
All-features plan



Guideline plan



Dimensioned plan



Hallum-Hellema Structure 8

10 m scale 1:200

Fig. STR8-1. Trench 6, level 4, showing part of northeast wall ditch (T6 L4 F119) and probable posthole (T6 L4 F137) along its interior side. Earlier ring ditch (T6 L4 F112) clearly recognisable in the middle of the photograph.

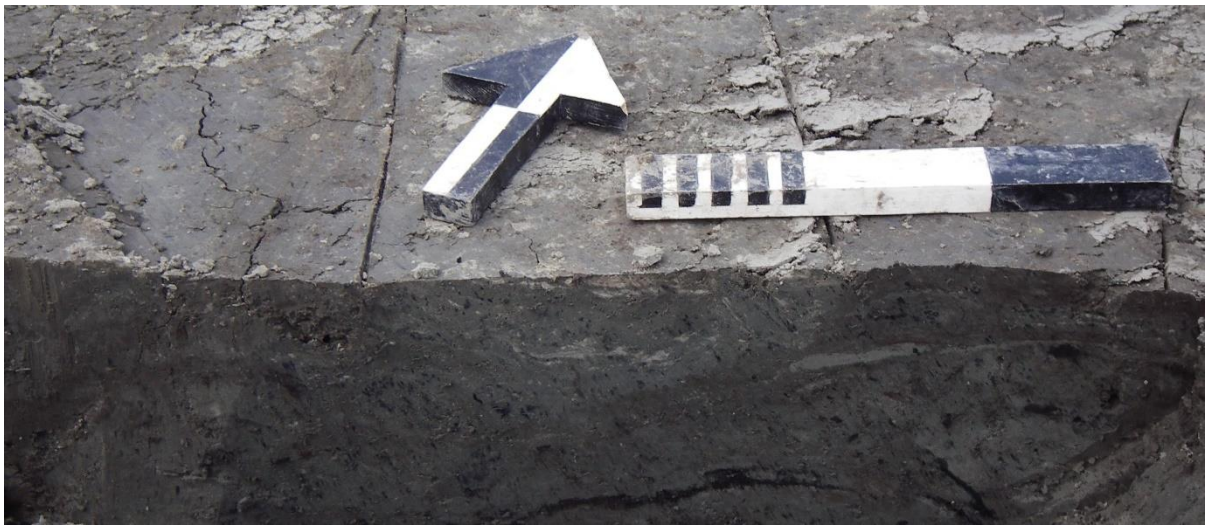


Fig. STR8-2. Section of wall ditch (T6 L4 F96) of the southwest long wall.

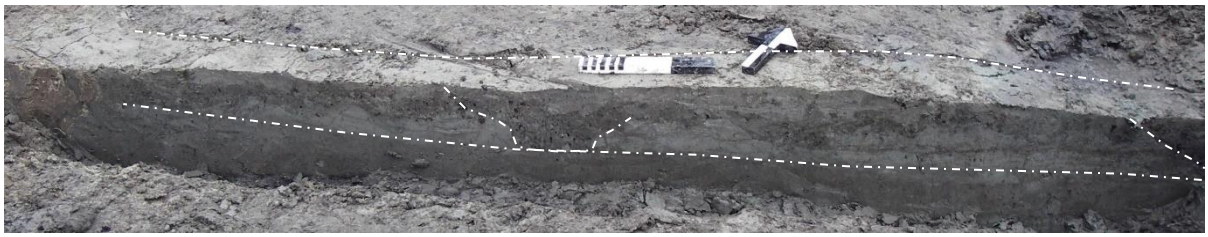


Fig. STR8-3. Longitudinal section of wall ditch (T6 L4 F99) of the northwest interior partition, showing two possible post pits (middle and far right).

Fig. STR8-4. Section of burn layer (T6 L4 F120) in front of southwest long wall (T6 L4 F96) sectioned along its length to the left.

Fig. STR8-5. Section of southwest boundary ditch (T5 L5 F204)

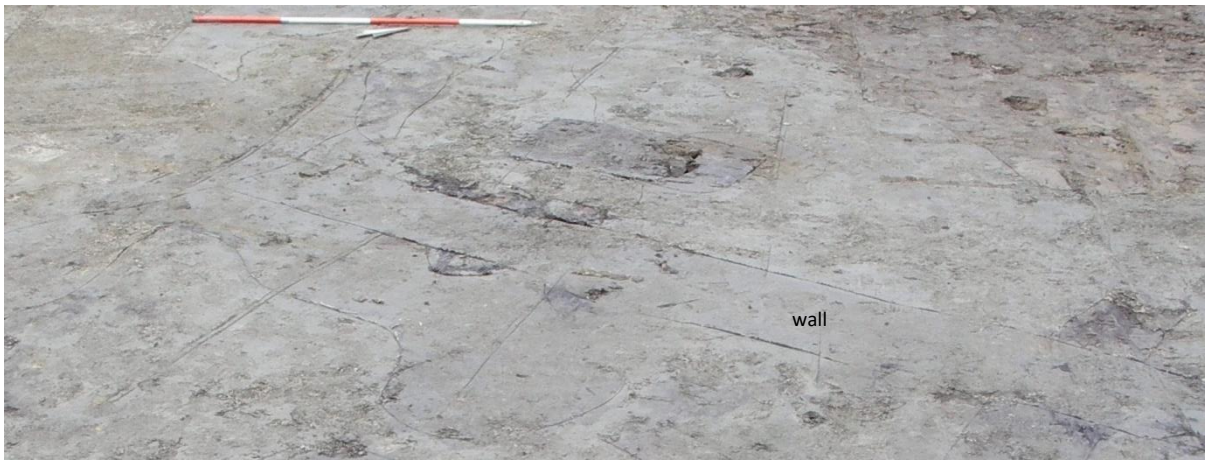


Fig. STR8-6. Trench 5, level 3, showing probable turf garden wall.

Structure 9 – Turf and timber church (provisional)

Location in excavation: trench 1, 5-6, level 2; north profile.

Number in Tuinstra *et al.* (2010): structure 20.

Functional typology framework:

1. Typology: primary architectural features are two turf walls – northeast wall (T6 L2 F15-17; Fig. STR9-1), recorded in plan; turf southwest wall, only discernible in the north profile (F1016-1017; Fig. STR9-2). The building's southwest short end is marked by a presumed wall ditch (T6 L2 F24-25, F29), classed as stain during excavation.
   The building's interior width was 4.5 m, its assumed interior length 15 m; not classifiable as a currently known type.

2. Use of space: no evidence of internal division is recognisable. A large loose-textured feature in the building's interior was noted in three excavation levels (T6 L2-4 F2); it was recorded as 'recent' but its layered and multi-coloured appearance in the photographs looks like that of floor and infill layers noted in other buildings. The feature's apparent depth (> 60 cm) is not like the more regularly shaped sunken floor in structure 17, however; it appears to concern an interior deepened not by design but through intensive use and periodic cleaning out. Similar deepening has been noted in byre areas of some Odoorn-C-type buildings (Waterbolk, 2009, p. 91), although there are no further indications that structure 9 may have been used as a byre.
   The most likely use of the building is suggested by the interpretation of its structural design and curtilage (see below), all of which are most reminiscent of a chapel of church building.

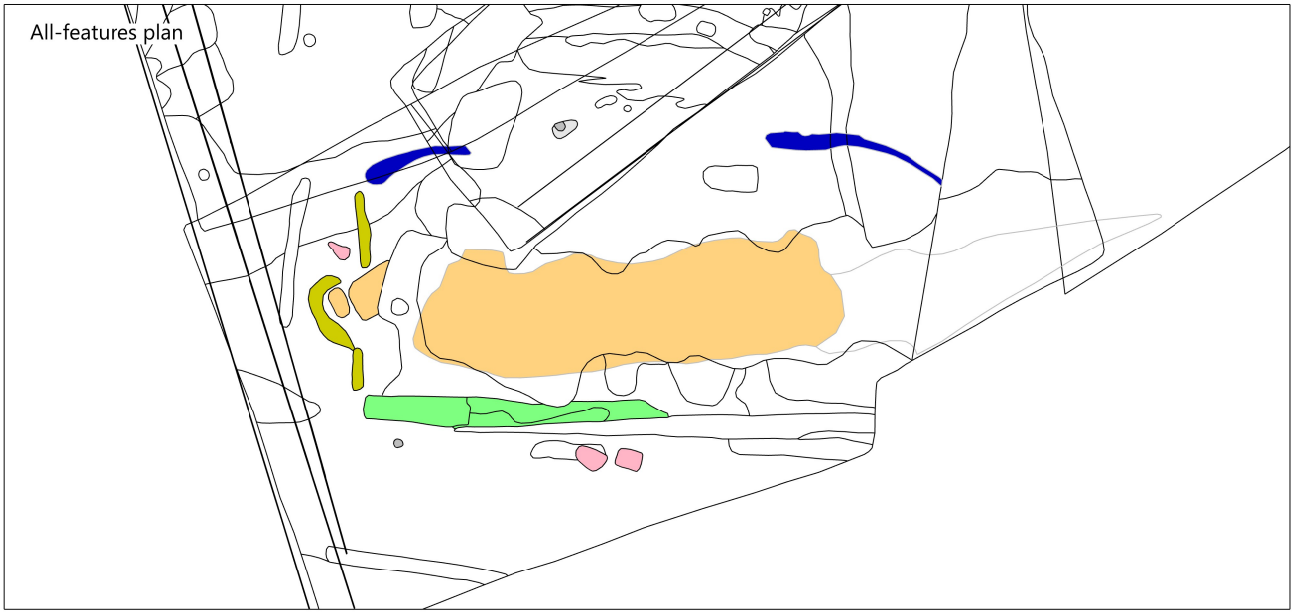
3. Building technology: both turf walls appear to have been constructed with (primarily) header courses; the level photograph suggests a wall thickness of 90 cm (Fig. STR9-3), but no detailed observations can be made with certainty. The wall ditch is thought to have contained timber wall elements.

4. Structural design (based in part on Postma 2015): interpreted as a building with load-bearing turf walls and a timber(-clad?) southwest gable with a central, apsis-like bulge.
   More tentatively, the two presumed posts outside the northeast wall (see context description below) are suggestive of an entrance with portal – does the post outside the opposite wall indicate another portal perpendicular to the southwest wall, framed on either side by a curved ditch? Unfortunately, we cannot be certain of this reconstruction without more detailed parallels.

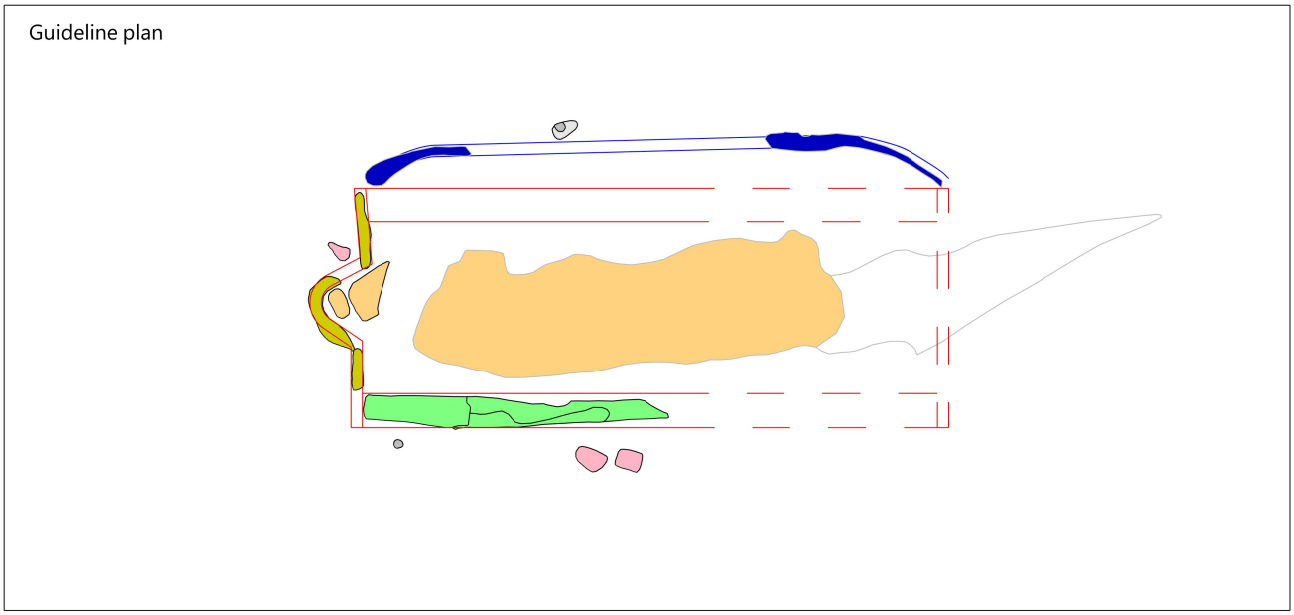
5. Context: two probable postholes were recorded just outside the building, one at its east corner (T6 L2 F14) and one at 1.6 m distance from the southwest wall (T1 L2 F19; Fig. STR9-4). Two squarish ash-rich features (T6 L2 F35-36), both positioned 80 cm from the building's northeast wall, may also represent the placement of posts, although this cannot now be confirmed.
   The building's southwest side appears to have been 'hugged' by a ditch (T6 L3 F42/46; Fig. STR9-3) with curved ends, believed to terminate at opposite corners of the building.

Dating: no contemporary buildings are known from the northern plots; overlies structure 8 but is not its (functional) successor; successor positioned closer to St Martin's church at the (later) centre of the terp? Attributed to phase X, Carolingian period, 8th-9th centuries (Table 4).

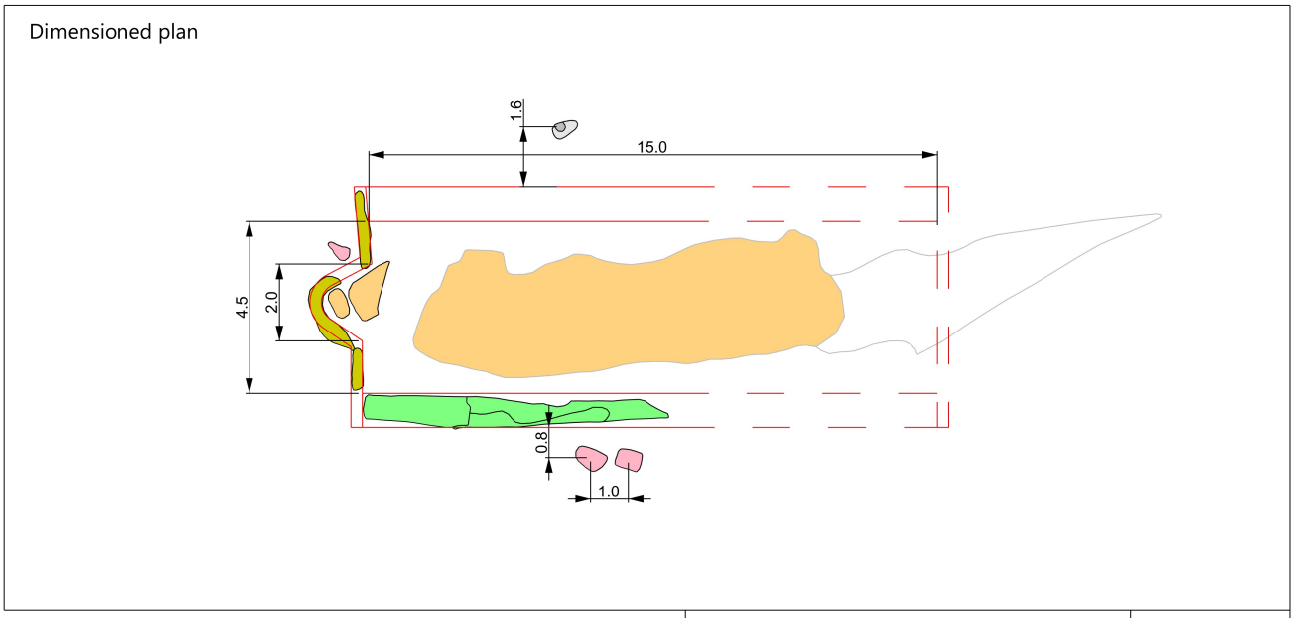
All-features plan



Guideline plan



Dimensioned plan



Hallum-Hellema Structure 9

10 m scale 1:200

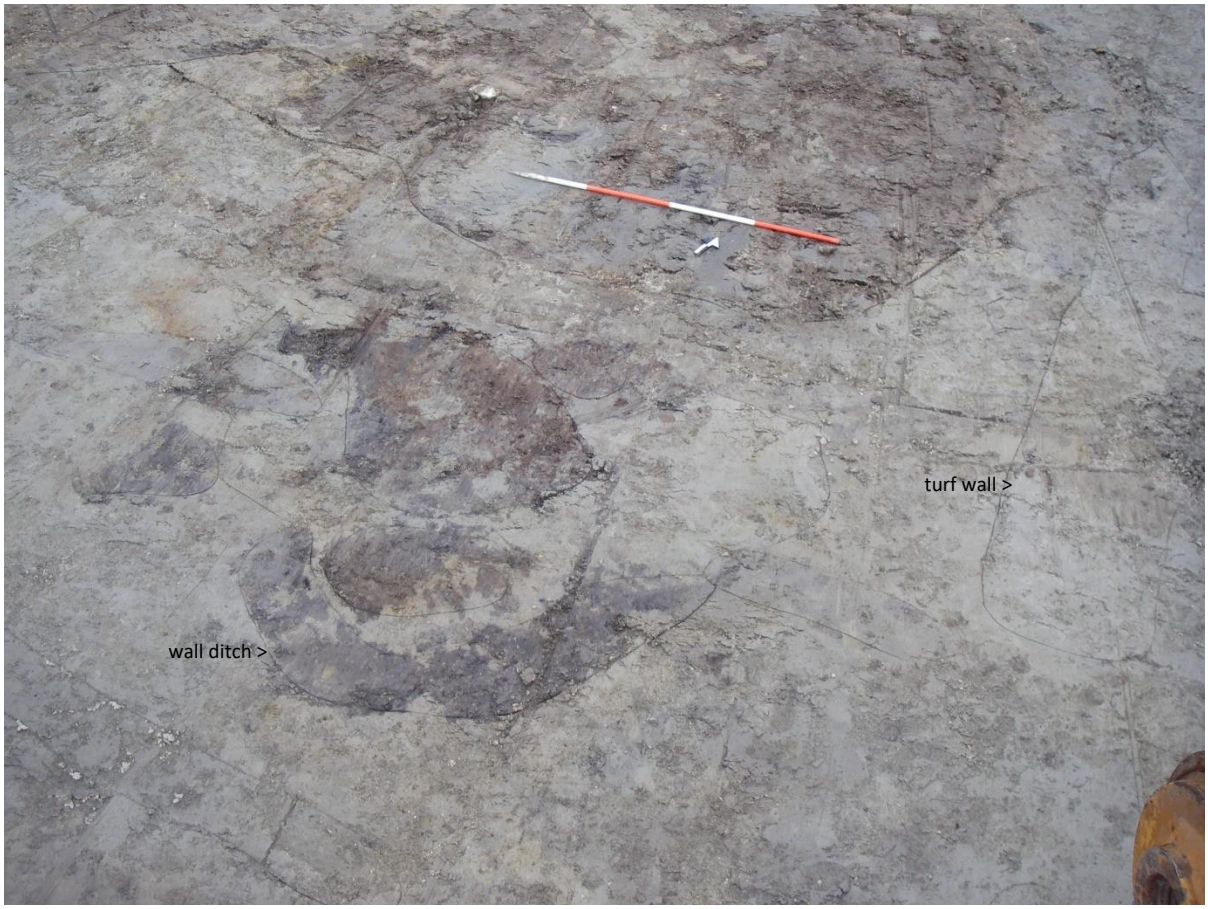


Fig. STR9-1. Trench 6, level 2, showing northeast turf wall (T6 L2 F15-17) and curved wall ditch (T6 L2 F24-25, F29).

Fig. STR9-2. North profile, cutting through the southwest wall (F1017; middle) and interior infill/floor layer (F1016; right).

Fig. STR9-3. Trench 6, level 3, showing loose interior fill (presumably; T6 L3 F2) and curved curtilage ditch (T6 L3 42).

Fig. STR9-4. Section of presumed post pit (T1 L2 F19).

3.5. House plans of the western plot

Structure 10 – Wide turf building (and narrower successor)

Location in excavation: trench 1, level 7, north profile.

Number in Tuinstra *et al.* (2010): -

Functional typology framework:

1. Typology: primary architectural features are three turf walls from two successive buildings. The walls of the earliest building are primarily discernible in the north profile (F930-932 and F912, also T1 L7 F184; Fig. STR10-2). A third wall (F917) placed in between the other two, is more readily observable in the excavation level (T1 L7 F172; Fig. STR10-1), giving an indication of these buildings' orientation. Working on the basis of that orientation, the original building had an interior width of 6.5 m, the latter 3.9 m.
   It is assumed that structure 10 started as a building of the Leens B type and was later reused as a narrower Leens A-like structure, similar to what is described for structures 12 and 15.

2. Use of space: suggested original use is as a either dwelling or super byre, latterly as unspecified outbuilding (compare structures 12 and 15).

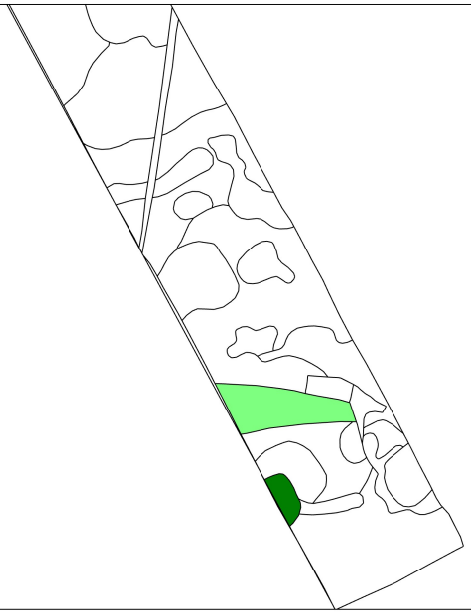
3. Building technology: the turves are not shown clearly enough in the north profile to confirm that a bonding system with header and stretcher courses was used, although that does seem very likely in view of the greater dimensions these walls and their turves. The earlier north wall and later south wall both show that the turves were cut ca 11 cm thick (Fig. STR10-3), nearly double that of turves in older walls. The building's original walls were ca 110 cm thick, the later insertion ca 120 cm.

4. Structural design (based on Postma 2015): the Leens B type is regarded as a single-aisled building with load-bearing turf walls; the greater thickness noted for the two original walls is believed to be a compensation for the use of thicker and therefore relatively weak turves.

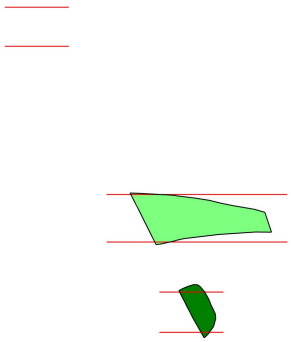
5. Context: building a 110 cm thick wall with 11 cm thick turves requires only two thirds of the surface area of grassland needed for a ca 90 cm thick wall with 6 cm thick turves, as used for structure 2 in the 5th-6th century. As the increased turf thickness in structure 10 appears to have weakened the walls, this technical concession to the quality of construction suggests that the (access to) available grassland for turf cutting was becoming very limited in this area in the 8th-9th century.

Dating: no contemporary buildings are known from the western plot; no known predecessor; succeeded by structure 11? Attributed to phases IX-X, Carolingian period, 8th-9th centuries (Table 4).

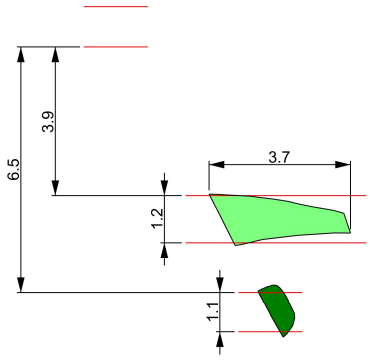
All-features plan



Guideline plan



Dimensioned plan



Hallum-Hellema Structure 10

10 m scale 1:200

Fig. STR10-1. Trench 1, level 7, showing the two easternmost turf walls of structure 10.

Fig. STR10-2. North profile, showing the three turf walls of structure 10.

Fig. STR10-3. Detail of the middle turf wall (F917) in the north profile, showing the use of ca 11 cm thick turves.

Structure 11 – Timber dwelling

Location in excavation: trench; base level; additional levels; profile

Number in Tuinstra *et al.* (2010): structure 15

Functional typology framework:

1. Typology: primary architectural features are a wall ditch with corner (T7 L4 F2) and a posthole (T1 L4 F89). The building's interior width of 6.4 m internally is based on the assumption that its construction was the same as that of the other timber dwellings (structures 8 and 16), with structural posts along the inside of the wall ditch.
   Not classifiable as a currently known type but assumed to be comparable with structure 8.

2. Use of space: suggested use, based on the building's width: dwelling (inclusion of byre unknown).

3. Building technology: wall ditches are thought to have contained timber wall elements, such as prefabricated wattle panels, but no details were recorded to be specific on their construction.

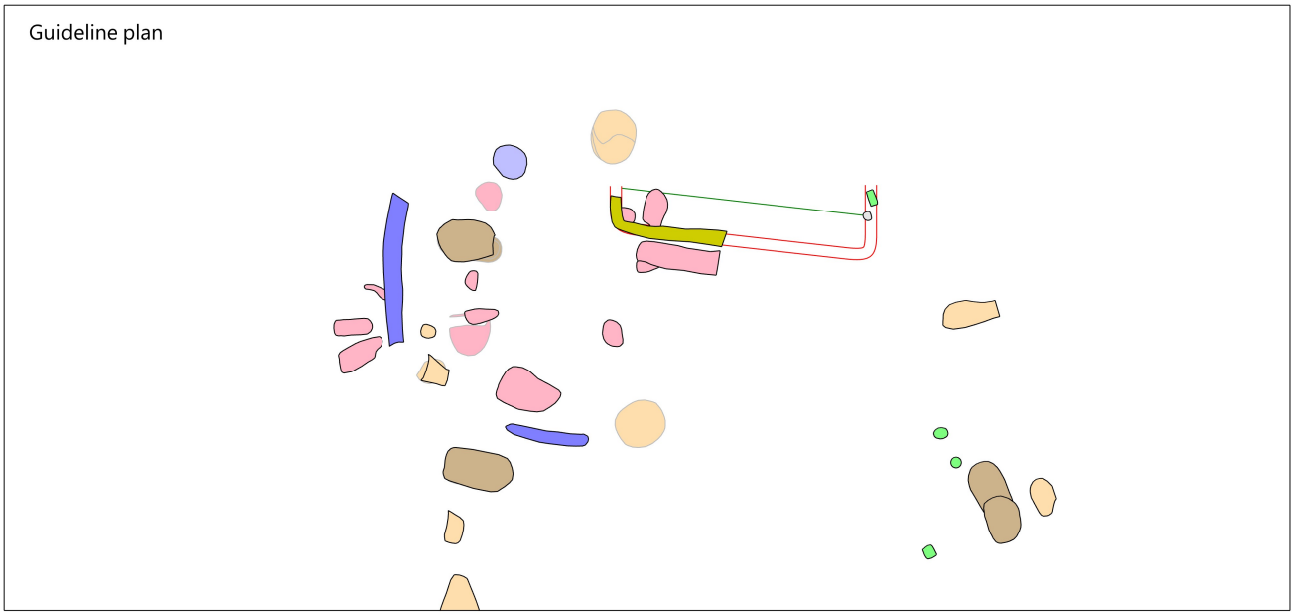
4. Structural design: -

5. Context: short sections of the plot's boundary ditch are discernible to the building's north (T7 L4 F18) and west (T7 L4 F32). A water well (T7 L4-5 F10) was situated to the north, too, and is assumed to be contemporary with the building. Many features in the building's curtilage were recorded as ash or burn layers, some of which can be confirmed as pits from their cross sections. The function of the pits is unknown.

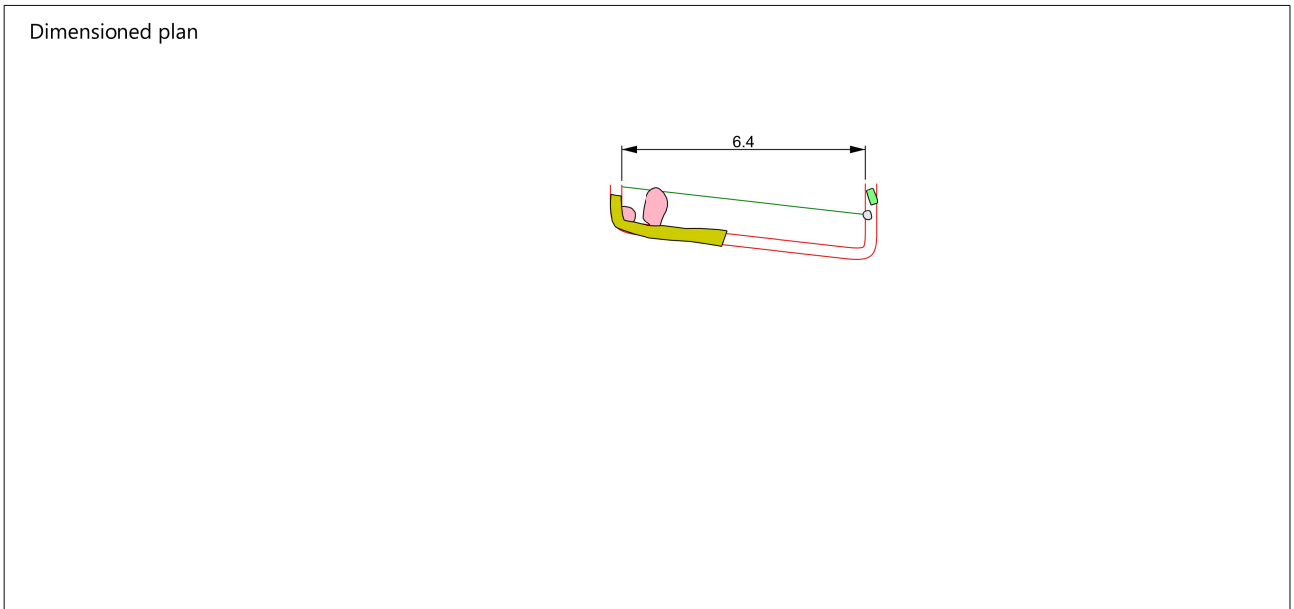
Dating: no contemporary buildings are known from the west plot; replaced structure 10? No known successor. Attributed to phase X, Carolingian, 8th-9th centuries (Table 4).

All-features plan

Guideline plan



Dimensioned plan



Hallum-Hellema Structure 11

10 m scale 1:200

Fig. STR11-1. Section of large pit to the northeast (T1 L4 F99-100).

Fig. STR11-2. Section of the large pit to the northwest (T7 L4-5 L33-34).

3.6. House plans southern southern plot

Structure 1 – Granary (along watercourse)

Location in excavation: trench 8, level 9.

Number in Tuinstra *et al.* (2010): -

Functional typology framework:

1. Typology: primary architectural feature are three posts of a presumably four-poster granary-type post arrangement – north post (T8 L9 F29), east post (T8 L9 F34) and south post (T8 L9 F37). Apparent dimensions were 2.1 x 2.9 m.

2. Use of space: a pit with burnt material (T8 L9 F28) was located in between the posts. Further details regarding the use of this structure, presumably for the storage of agricultural produce with a relevance to transport per boat, is discussed below.

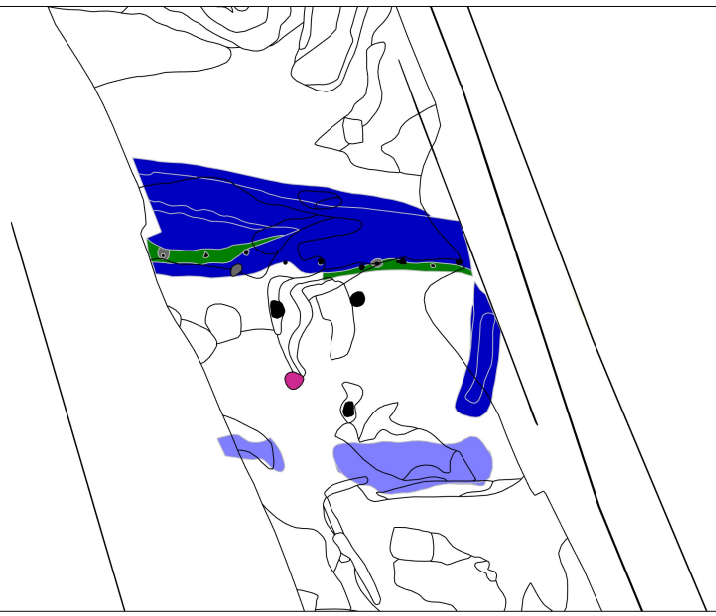
3. Building technology: -

4. Structural design: -

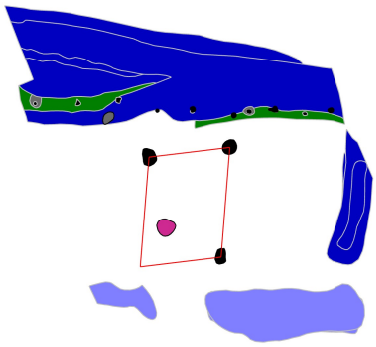
5. Context: the structure was placed on the artificially raised southwest bank of a level-bottomed ditch directly north of the southern plot. Steep-sides ditches (T8 L10-11 F113; T8 L11 F157/166) appear to have formed a rectangular enclosure inhibiting access to the structure from all sides. As this side of the watercourse was embanked with a wall of turf into which posts were set or driven, it is believed the granary was intended to be accessible by boat.

Dating: no contemporary buildings are known from the site, and no predecessors or later replacements. Attributed to phase IV, Early Migration period, 5th century (Table 4).

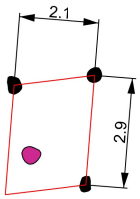
All-features plan



Guideline plan



Dimensioned plan



Hallum-Hellema Structure 1

10 m scale 1:200

Fig. STR1-1. Sections through east post (left; T8 L9 F34) and south post (right; T8 L9 F37).

Fig. STR1-2. Sections through feature with burnt fill (left; T8 L9 F28) and north post (right; T8 L9 F29).

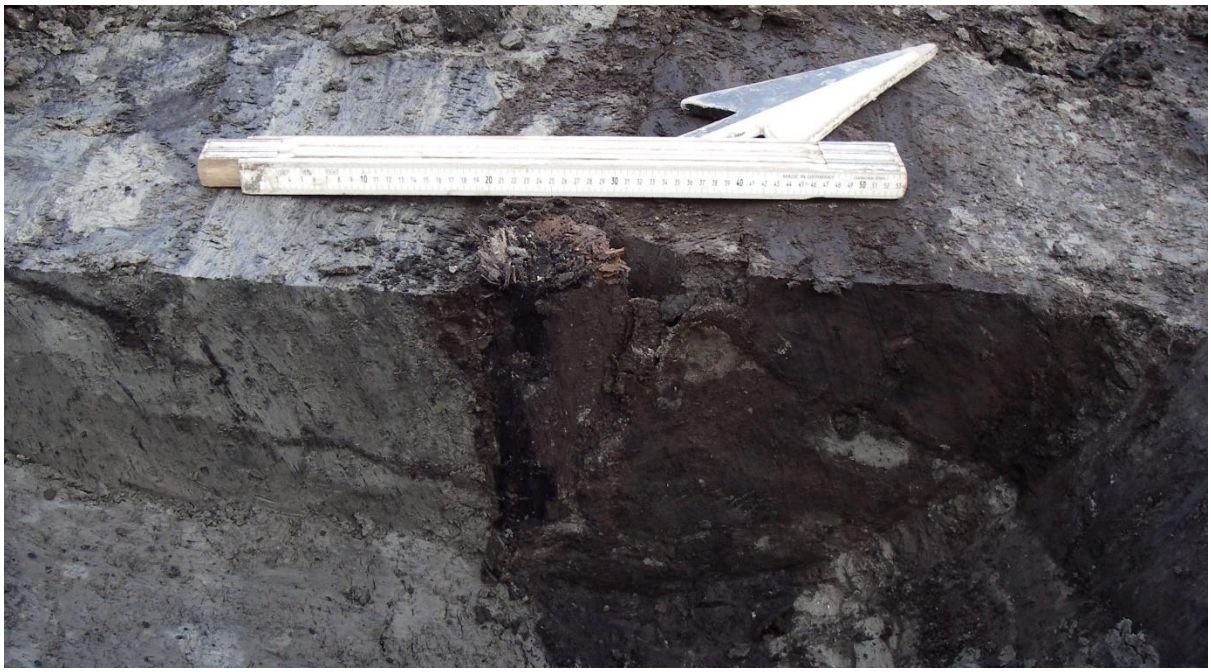


Fig. STR1-3. Section through the timber revetment (T8 L10 F4), showing thick turf block embankment behind.

Fig. STR1-4. Overview of revetment posts (T8 L8 F4) in plan and section of the turf-built embankment in the east profile behind.

Structure 12 – Turf super byre

Location in excavation: trench 2 and 3, level 7.

Number in Tuinstra *et al.* (2010): structures 3-5.

Functional typology framework:

1. Typology: primary architectural features are the turf walls of three sides of the building – southwest short wall (T2 L7 F418; T3 L7 F230-233), northwest long wall (T2 L6-8 F336; T3 L8 F329) and northeast short wall (T2 L6-7 F247). An internal partition wall (T2 L7 F413-414) formed an on average 1.9 m long room in the building's higher southwest end.
   A single post in the building's interior concerns the lower end of an interior post from structure 15. No other (possible) posts can be identified in the building's interior.
   The building's interior was 6.9 m wide, 12 m long and skewed in plan; classed as Leens B type.

2. Use of space: in addition to the separate room mentioned above, the much larger lower room of the building was taken up entirely by a byre area. This byre is clearly indicated by a deep manure-filled drain (T2 L7-8 F428; T2 L8 F506) along the entire northeast short wall and about three quarters (presumably) of the northwest long wall, as well through the interior (T2 L6 F254), creating a U-shape in plan. Its shape and fill are clearly visible in sections perpendicular to each of the three walls (Fig. STR12-10, Fig. STR12-11 and Fig. STR12-12). The drain evidently emptied through a narrow passage in the lower courses of the long wall (Fig. STR12-8).
   Suggested use: exceptionally large byre with (presumed) work area.

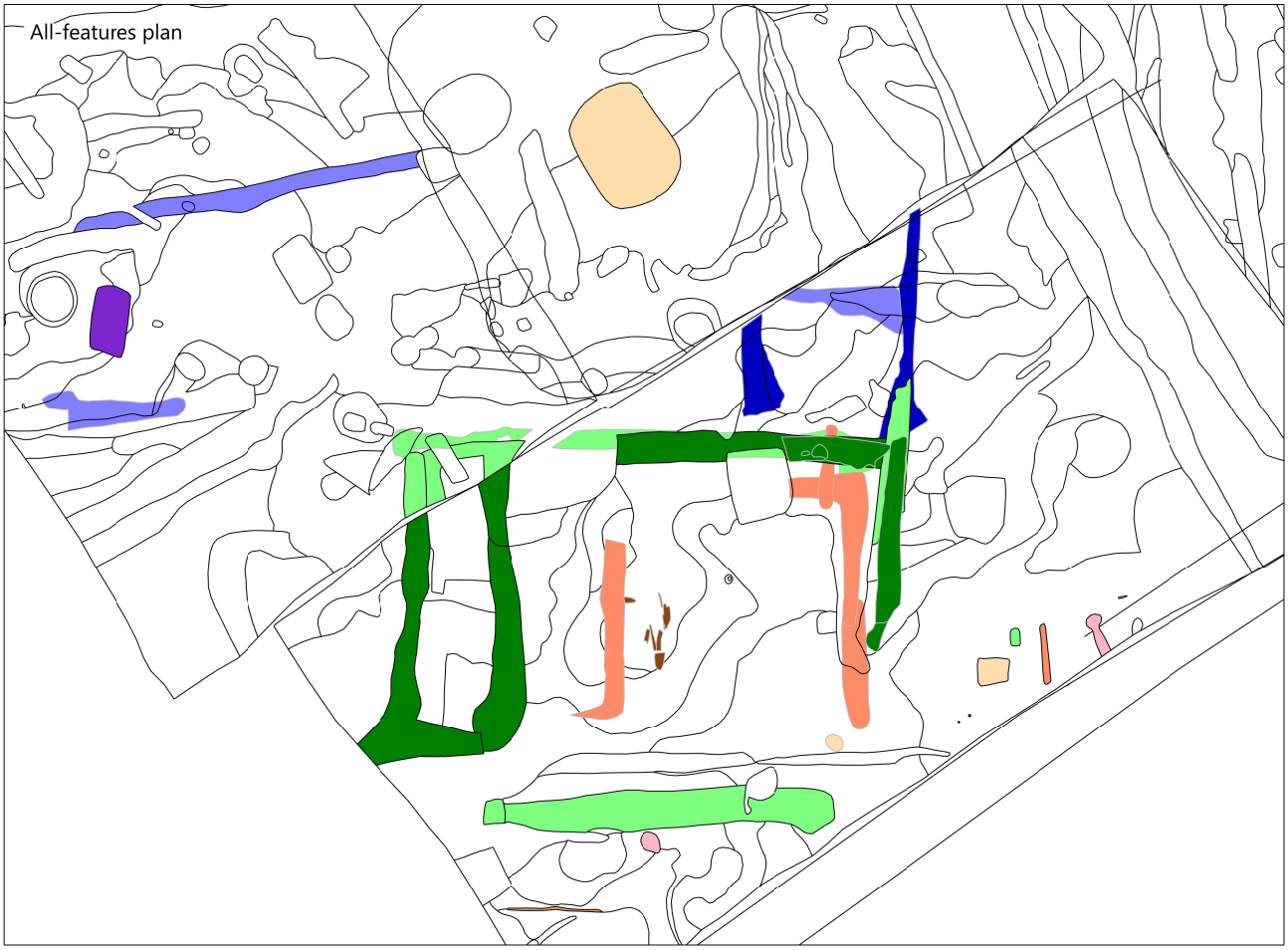
3. Building technology: sections through all three walls provide relatively detailed technical information. The short walls were 60 cm thick and constructed with full-width header courses, each 6 cm thick (Fig. STR12-4; Fig. STR12-5). The partition wall was of the same thickness (Fig. STR12-7; Fig. STR12-6). The long wall was 80 cm thick originally, eroded back to 60 cm along the byre drain, where manure can be seen in between the worn-back turves (Fig. STR12-2; Fig. STR12-3). Here, too, full-width header courses of 5-6 cm thickness were used.

4. Structural design (based on Postma 2015): interpreted as a single-aisled building with load-bearing turf walls. The average heart-to-heart distance between the southwest and partition wall, suggest a 2.5 m bay size that works well for the whole building. The partition wall furthermore suggests that the trusses were placed at an angle (in plan), for stability.

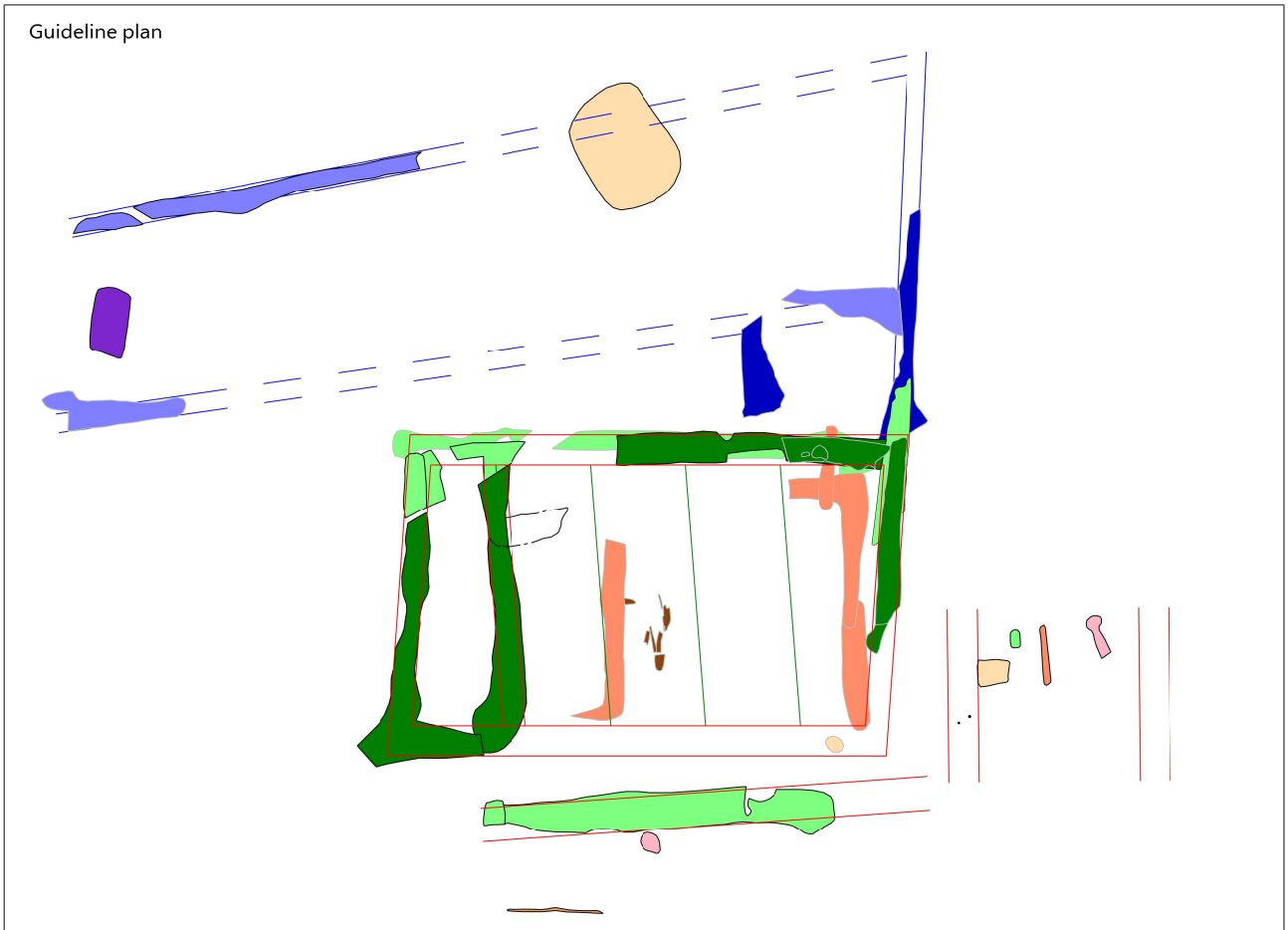
5. Context: the byre drain emptied into a square at the north corner of the building, surrounded by ditches (T2 L8 F247, probably also T2 L8 F561; Fig. STR12-8). It is believed this arrangement was for the urine to seep out, until the manure could be used to heighten the settlement mound.
   A probable boundary ditch (T3 L8 F330) was noted southwest of the building. A rectangular feature measuring 3.2 x 2.4 m lay just outside the plot and is believed to have been the pit of a contemporary sunken feature building that was dug into the side northwest slope of the terp (compare structure 4), although this cannot be confirmed. The boundary ditch was moved northwest (T3 L7 F227) as the terp expanded. At that time, the presumed sunken feature building had gone out of use – replaced by structure 14?
   A double inhumation was recorded within this latest perimeter of the extended plot. Its position as well as its orientation, parallel to the building's southwest short wall and the plot's northeast boundary ditch, suggest the grave was contemporary with this building.

Dating: contemporary with structure 13 and latterly structure 14; no known predecessor; succeeded by structure 15. Attributed to phase VI, Merovingian period, 6th-7th centuries (Table 4).

All-features plan



Guideline plan



Hallum-Hellema Structure 12

10 m scale 1:200

Dimensioned plan

Hallum-Hellema Structure 12

10 m scale 1:200

Guideline plan

Hallum-Hellema Structure 12 and 15

10 m scale 1:200

Fig. STR12-1. Trench 2, level 7, showing the northwest long wall (T2 L7 F336) and northeast short wall (T2 L7 F247).

Fig. STR12-2. Section of northwest long wall in level 6 (T2 L6 F336), showing intrusion of manure on the interior side (right).

Fig. STR12-3. Section of northwest long wall in level 7 (T2 L7 F336)

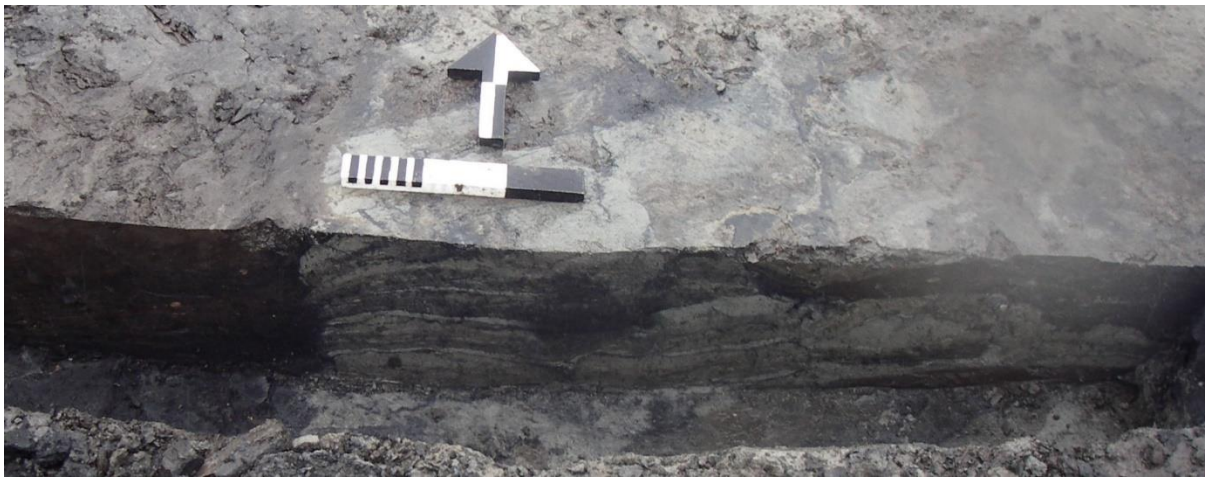


Fig. STR12-4. Section of the southwest short wall (T2 L7 F418).

Fig. STR12-5. Section of northeast short wall (T2 L6 F247).

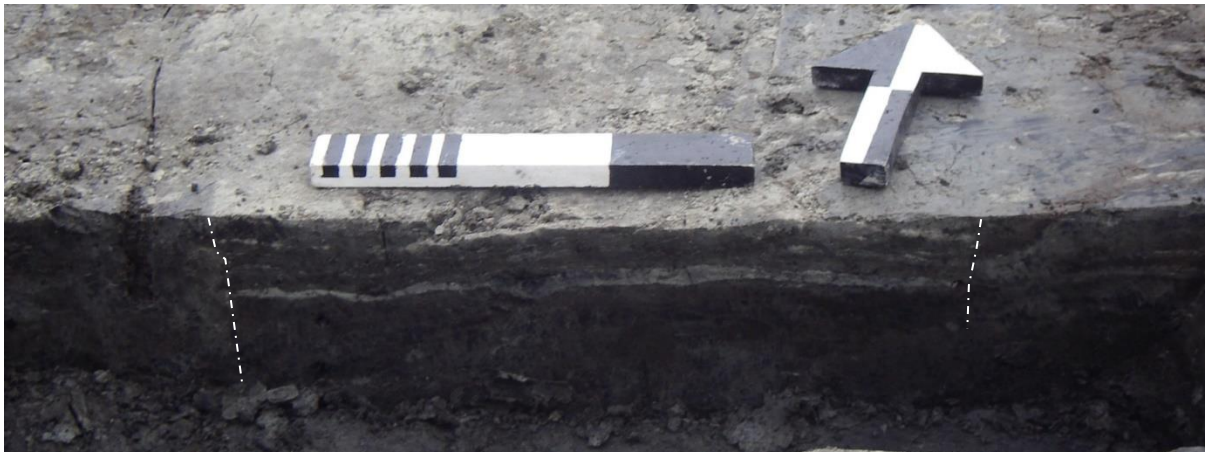


Fig. STR12-6. Cross section of the partition wall (T2 L7 F413).

Fig. STR12-7. Longitudinal section of the partition wall (T2 L7 F414).

Fig. STR12-8. Trench 2, level 8, showing the lower courses of the northwest long wall (T2 L8 F336), the byre drain (T2 L8 F428/506) and turf-filled exterior ditches (T2 L8 F247/561).

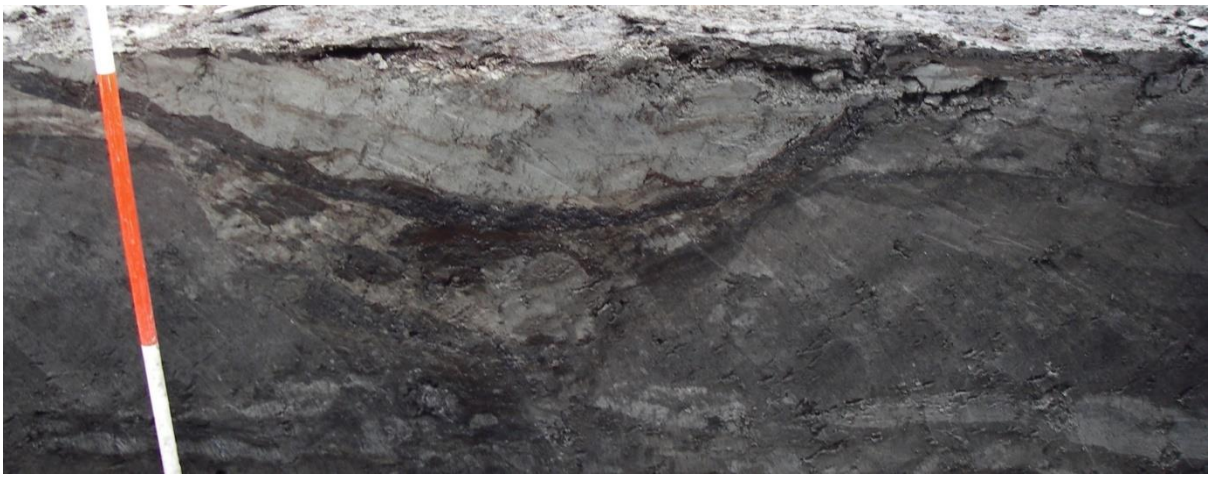


Fig. STR12-9. Section of the turf-filled exterior drainage ditch (T2 L8 F247).

Fig. STR12-10. Section of the byre drain (T2 L7 F428) along the northeast short wall.

Fig. STR12-11. Section of the byre drain (T2 L6 F254) through the interior.

Fig. STR12-12. Section of the byre drain (T2 L8 F428) along the northwest long wall.

Structure 13 – Turf byre

Location in excavation: trench 2, level 7; east profile.

Number in Tuinstra *et al.* (2010): -

Functional typology framework:

1. Typology: primary architectural features are two low turf walls discernible in the east profile (Fig. STR13-1).

2. Use of space: a ditch (T2 L7 F456) in the building's interior, running parallel to the southwest wall at 1.8 m, is interpreted here as a byre drain. A loose turf (T2 L7 F457) and the apparent 'end bulge' of an ash-rich feature (T2 L7 F455) may be indicative of interior posts, set 1-1.2 m from the interior wall faces, but this interpretation cannot be confirmed. Equally uncertain is the function of a pit (T2 L7 F458) in the building's interior.
   Suggested use: byre, possibly with loft.

3. Building technology: the contours of individual turves are not clear enough to be specific on the bonding system and course thickness.

4. Structural design (based on Postma 2015): interpreted as a building with roof-supporting turf walls and possibly a loft supported by two rows of interior posts.

5. Context: set alongside and perpendicular to structure 12.

Dating: contemporary with structure 12; no known predecessor from the south plot; succeeded by structure 14. Attributed to phase VI, Merovingian period, 6th-7th centuries (Table 4).

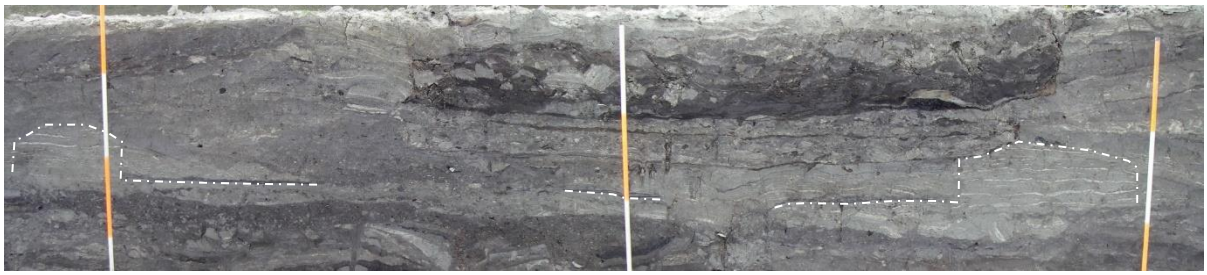
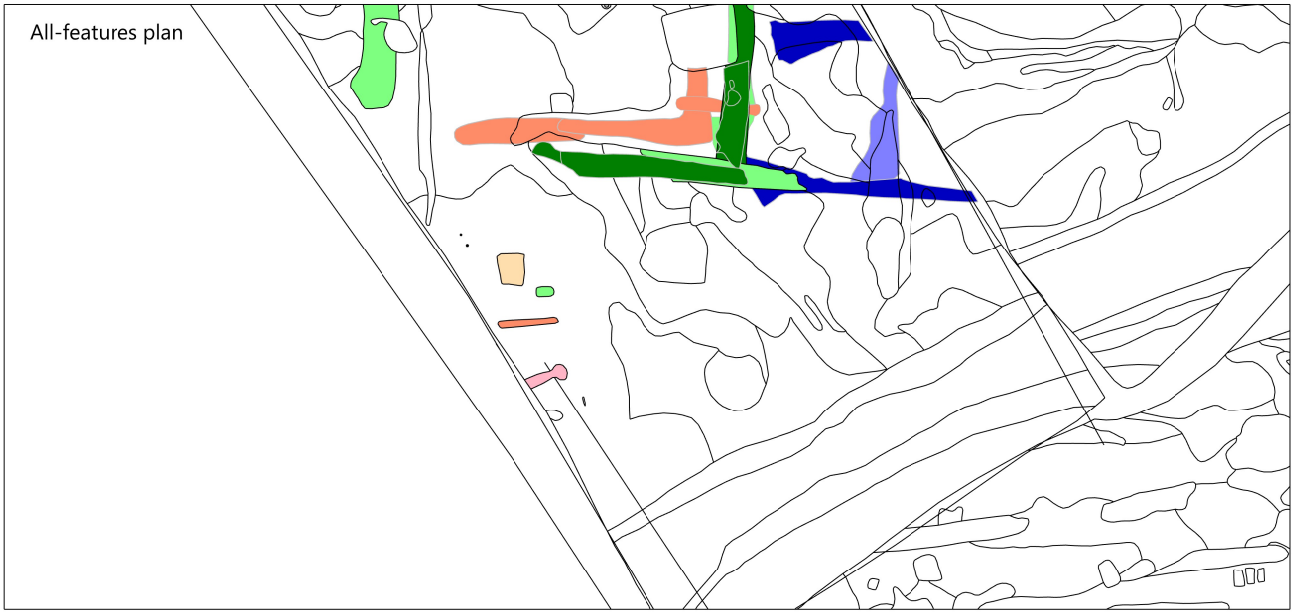


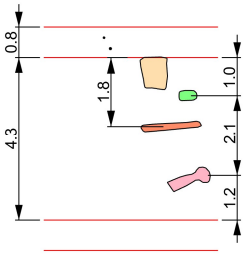
Fig. STR13-1. North profile showing approximate section of structure 13.

All-features plan



Guideline plan

Dimensioned plan



Hallum-Hellema Structure 13

10 m scale 1:200

Structure 14 – Turf shed

Location in excavation: trench 2, level 7; east profile.

Number in Tuinstra *et al.* (2010): structure 5.

Functional typology framework:

1. Typology: primary architectural features are two opposing turf walls clearly discernible in the east profile (F1064/1066 and F1017; Fig. STR14-2). The northwest wall was also recorded in plan (T2 L7 F442; Fig. STR14-1).
   The building's interior width was 3.7 m, its length at least 11.9 m; classed as Leens C type.

2. Use of space: A posthole was recorded in section in the east profile (F1032) and horizontal a horizontal piece of timber in plan (T2 L7 F448), but these do not form an evident interior arrangement.
   Suggested use based on interior width: shed (e.g. barn or workshop).

3. Building technology: based on the plan and the profile, the thickness of both walls was ca 90 cm, constructed with 7-8 cm thick header courses (Fig. STR14-3).
   The profile section of the northeast wall shows a posthole (F1065) in line with the turf wall. It cannot be ascertained whether the post belonged to a door or roof structure in this building or was dug in during a later period.

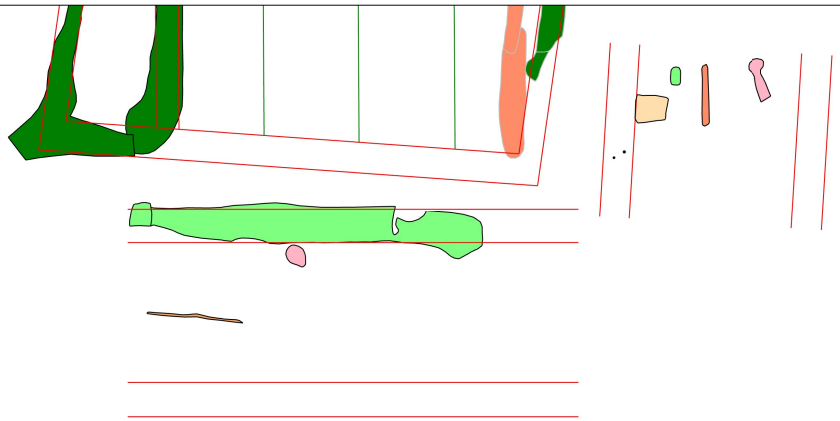
4. Structural design (based on Postma 2015): interpreted as a single-aisled building with roof-supporting turf walls.

5. Context: set closely alongside structure 12 and latterly structure 15. A deposit of animal bones (T2 L5 F286) was recorded in the area between these buildings.

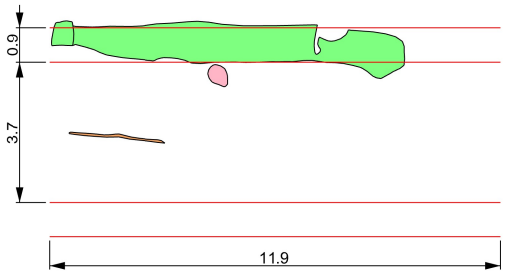
Dating: contemporary with structure 12 and latterly structure 15; overlies and replaces structure 13, albeit with an apparently different use; succeeded by structure 18. Attributed to phase VII, Merovingian period, 6th-7th centuries (Table 4).

All-features plan

Guideline plan



Dimensioned plan



Hallum-Hellema Structure 14

10 m scale 1:200

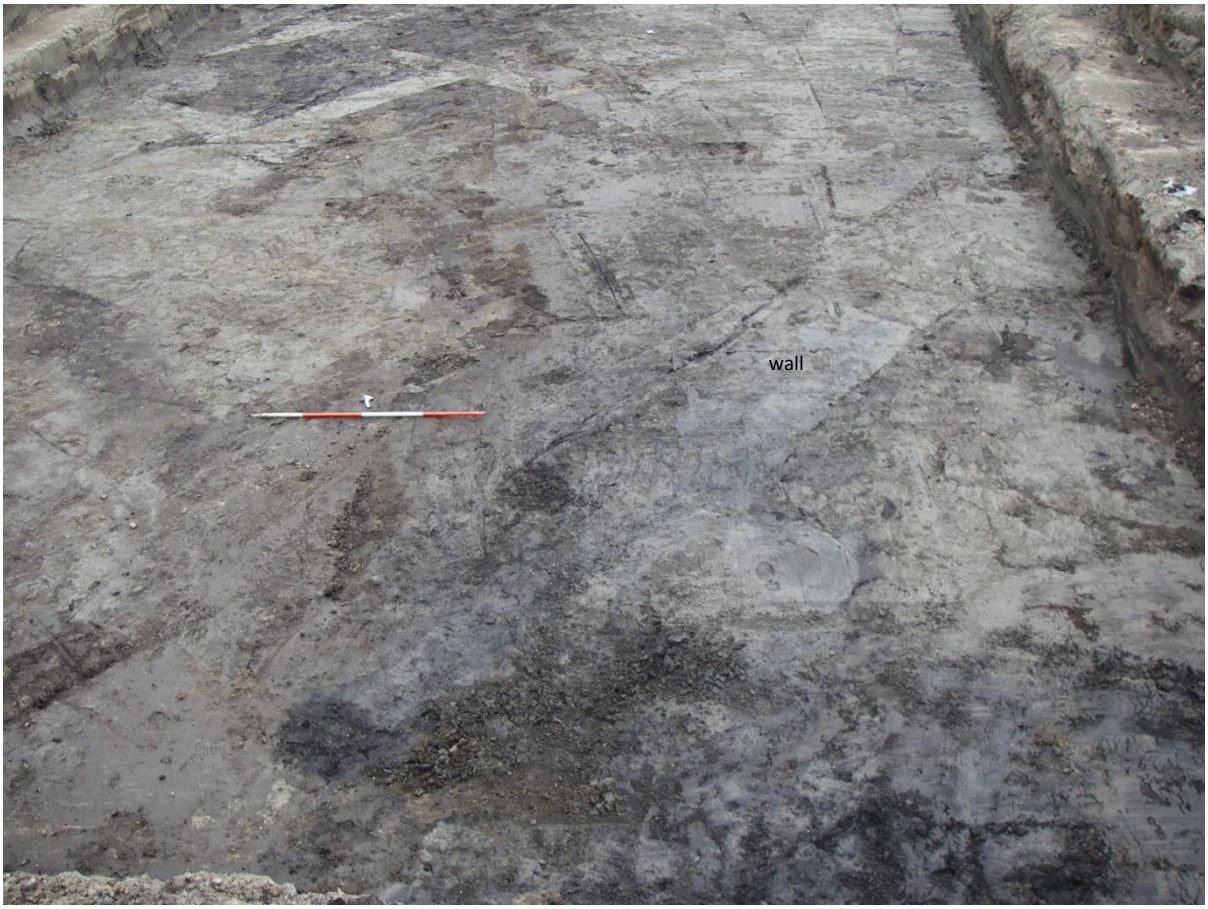


Fig. STR14-1. Trench 2, level 7, showing northwest long wall (T2 L7 F442).

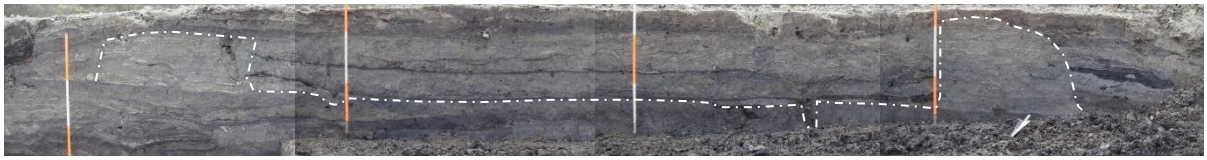


Fig. STR14-2. East profile, showing approximate section of structure 14.

Fig. STR14-3. Detail of northwest wall (T2 L7 F442), suggestive of the use of 7-8 cm thick header courses.

Structure 15 – Turf byre

Location in excavation: trench 2, level 6.

Number in Tuinstra *et al.* (2010): structure 7.

Functional typology framework:

1. Typology: primary architectural features are the turf walls of three sides of the building – southwest short wall (T2 L6 F378-379 and F389, also T2 L7 F414), northwest long wall (T2 L6 F340 and F373-374) and northeast short wall (T2 L5-7 F247). The building reused the existing short walls of structure 12.
The remains of five posts form two rows, illustrating a partially three-aisled interior – post nearest the north corner (T2 L5 F320); middle posts in the northwest row (T2 L5 F321) and southeast row (T2 L5 F278); post at the southwest end of the middle aisle (left; T2 L6 F362); post pit at the southeast end of the middle aisle (T2 L6 F393). Sections are shown below. The posts indicate that the building had five bays, with bay sizes varying from 1.7-2.3 m.
A doorway is discernible in the southwest short wall (Fig. STR15-4). This was placed off-centre, similar to structures 5 and 7. It is not certain whether the opening was cut into the reused interior wall of structure 12 or if it was there previously.
The building's interior was 9.5 m long internally. Its width is not certain; when the relatively wide northwest bay is mirrored on the southeast side of the normal-sized (2.1 m wide) middle aisle, the building's interior width is reconstructed as 5.5 m. As this is uncommonly wide in comparison with the other byres from Hallum-Hellema, a smaller width of ca 1 m may be assumed for the southeast aisle. This interpretation is also likely because it allows the building's new southeast wall to join with the end of the reused partition wall of structure 12, and it allows for a more practical spacing between its long wall and the adjacent structure 14.
Suggested use: byre (or barn?) with loft and (presumed) work area. Classed as Leens A type.

2. Use of space: the interior posts indicate the presence of a loft (see structural design). No byre drain is discernible that can be related to this building. An individual post (T2 L5 F333; Fig. STR15-5) was situated in the building's west corner but its use is not known.

3. Building technology: see structure 12 for details on the short walls. The newly inserted long wall (T2 L6 F373-374; Fig. STR15-3) was ca 75 cm thick and constructed with header courses ca 5-6 cm thick.

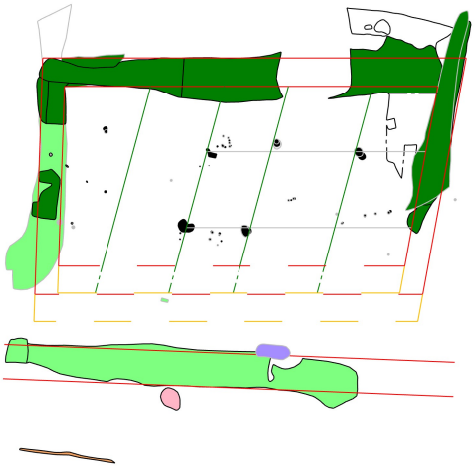
4. Structural design (based on Postma 2015): interpreted as a building with roof-supporting turf walls and a loft supported by two rows of interior posts.

5. Context: set alongside structure 14. A deposit of animal bones (T2 L5 F286) was recorded in the area between the two buildings.

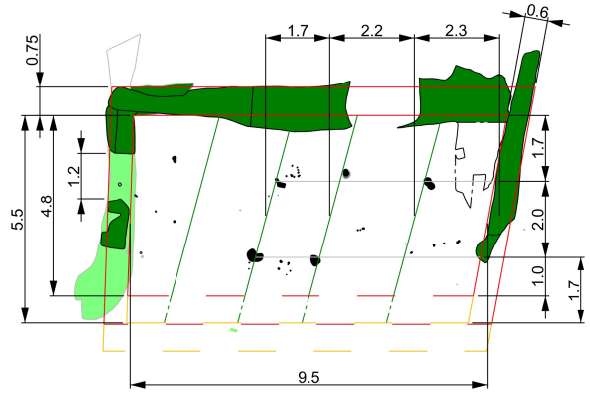
Dating: contemporary with structure 14; replaced and reused walls of structure 12; no known successor, though overlain by possible structure 16. Attributed to phase VII, Merovingian period, 6th-7th centuries (Table 4).

All-features plan

Guideline plan



Dimensioned plan



Hallum-Hellema Structure 15

10 m scale 1:200

Fig. STR15-1. Trench 2, level 6, showing interior posts (marked with sticks) and the northeast short wall (T2 L5 F247).

Fig. STR15-2. Trench 2, level 6, showing the northwest long wall (T2 L6 F373-374) and partition wall ditch (T2 L6 F254).

Fig. STR15-3. Section of the northeast long wall (T2 L6 F373-374).

Fig. STR15-4. Longitudinal section of the southwest short wall (T2 L6 F378-379 and F389), with door opening and post.

Fig. STR15-5. The post nearest the building's west corner (left; T2 L5 F333) and north corner (right; T2 L5 F320).

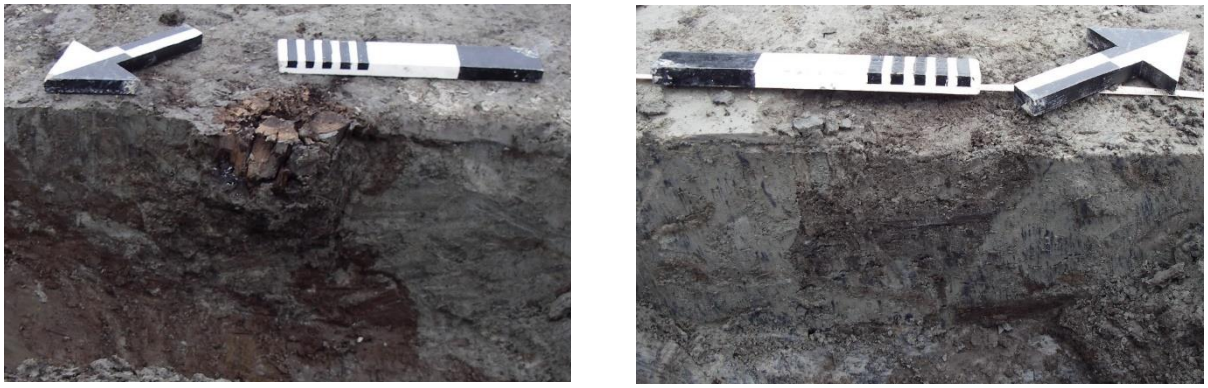


Fig. STR15-6. The middle posts in the northwest row (T2 L5 F321) and southeast row (T2 L5 F278).

Fig. STR15-7. The horizontal timbers (T2 L6 F365, F367-368) attributed to structure 12 and a vertical post (left; T2 L6 F362) attributed to structure 15, at the southwest end of the middle aisle.

Fig. STR15-8. Section of the post pit (T2 L6 F393) at the southeast end of the middle aisle.

Structure 16 – Timber dwelling (possible)

Location in excavation: trench 2, level 4.

Number in Tuinstra *et al.* (2010): structure 27.

Functional typology framework:

1. Typology: primary architectural features are a presumed wall ditch (T2 L4 F115) and a single posthole (T2 L4 F179; Fig. STR16-1) and four features that may be regarded as possible postholes or (removal) pits – a loose turf (T2 L4 F176), considered here as posthole backfill, an ash-rich feature (T2 L4 F163) and two unspecified pits (T9 L5 F31 and T3 L5 F181). Following the suggestion of the excavators that a wide timber building stood in this location, the guidelines of structure 8 have been projected in the plans below, its interior width slightly reduced and its house ends squared to better fit the evidence for structure 16.
   This comparative exercise produces a highly speculative structure that is indeed almost identical to structure 8, with internal dimensions of ca 5.6 x 18.2 m (see structure 8 for other measurements and considerations on its classification).

2. Use of space: presumed to have been divided in three rooms, one partition for which is suggested by the unconfirmed wall ditch (but compare Fig. STR16-2).

3. Building technology: the sectioned post pit was ca 40 cm wide (Fig. STR16-1).

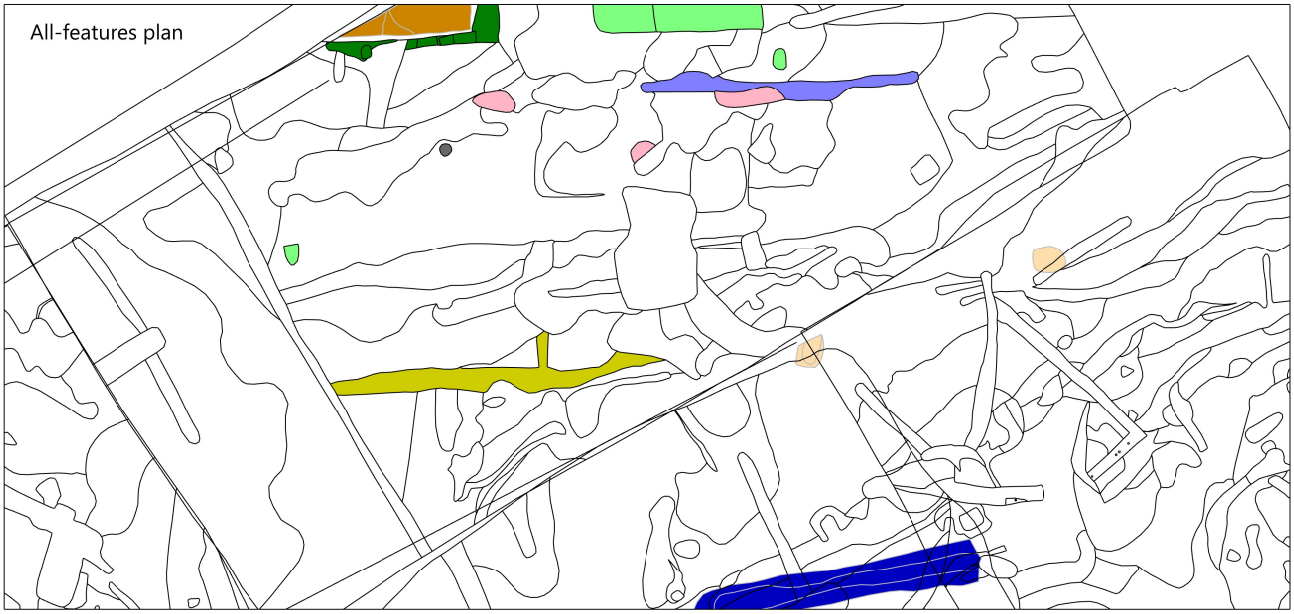
4. Structural design: if the projected guidelines are correct, which cannot now be ascertained, the two possible posts in the middle of the short ends may be regarded as end cuppills: half trusses placed perpendicular to the full trusses to provide additional stability along the length of the building (Postma, 2015, pp. 216–217).

5. Context: this possible timber building would have stood alongside structures 17 and 18. Ash-rich features (T2 L4 F164/180) and a 'filthy' occupation layer (T2 L4 F158) are suggestive of a drainage gully in the narrow area between this building and its neighbours. The earlier boundary ditch along the northwest side of the southern plot (see structure 12) appears to have been recut (T9 L5 F13-14) during this period.

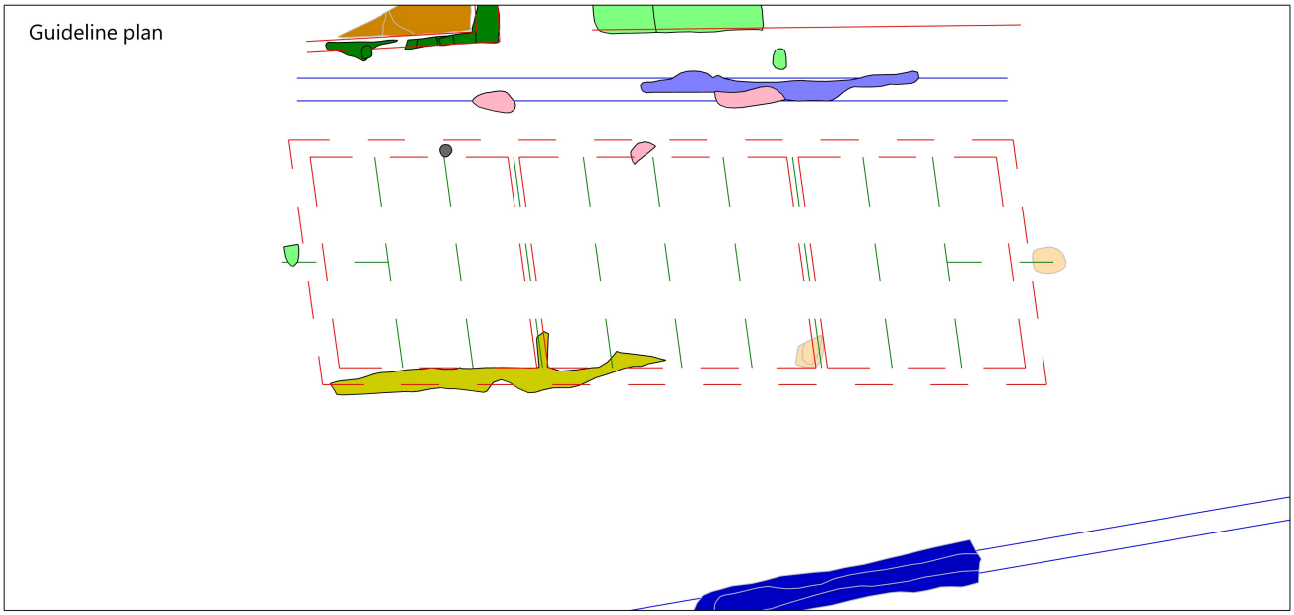
Dating: contemporary with structures 17 and 18; may have replaced structure 15; is overlain by structure 19, serving a different use. Attributed to phase VIII, Carolingian period, 8th-9th centuries (Table 4).

Fig. STR16-1. Section of the only confirmed post pit (T2 L4 F179).

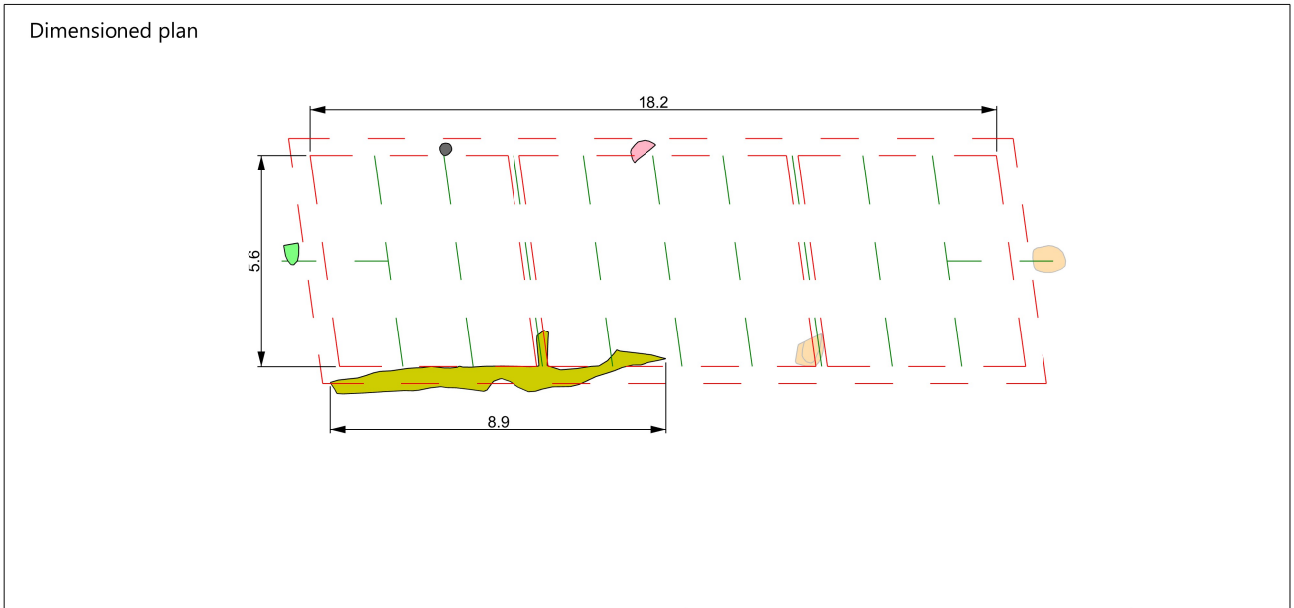
All-features plan



Guideline plan



Dimensioned plan



Hallum-Hellema Structure 16

10 m scale 1:200

Fig. STR16-2. Trench 2, level 4, showing the latterly presumed wall ditch (T2 L4 F115). The suggested partition wall cannot be made out in the photograph.

Structure 17 – Sunken feature building

Location in excavation: trench 2, level 4; east profile.

Number in Tuinstra *et al.* (2010): structure 8.

Functional typology framework:

1. Typology: primary architectural features are its sunken floor pit (T2 L5 F293-294) and turf exterior walls (T2 L4 F188, F199 and F204) set on the surrounding occupation surface (Fig. STR17-1 and Fig. STR17-2).
   The building's interior dimensions were at least 4.5 x 2.6 m; classed as sunken feature building.

2. Use of space: suggested use is as workspace.

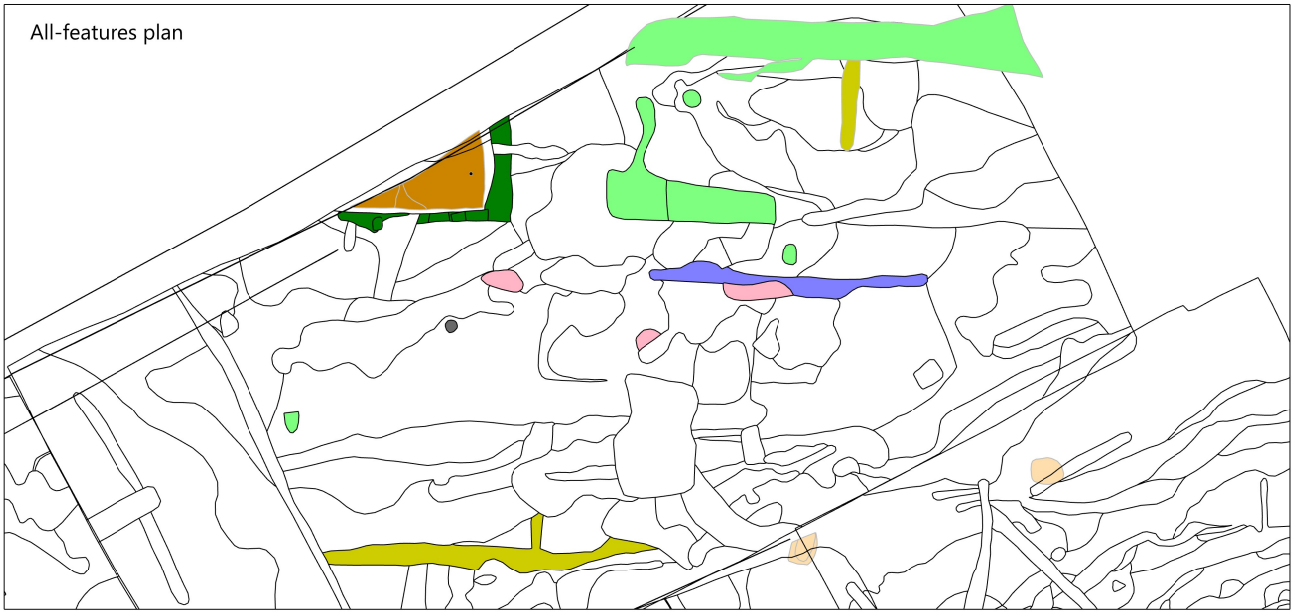
3. Building technology: based on the plan drawings and the east profile, the walls are drawn here with thicknesses of 30 and 60 cm, but their dimensions cannot be established with certainty.

4. Structural design (based partly on Postma 2015): interpreted as sunken feature building with possible load-bearing turf walls. If the higher-placed northwest was indeed significantly thicker than its northeastern counterpart, this is thought to indicate that this side of the building was gabled.

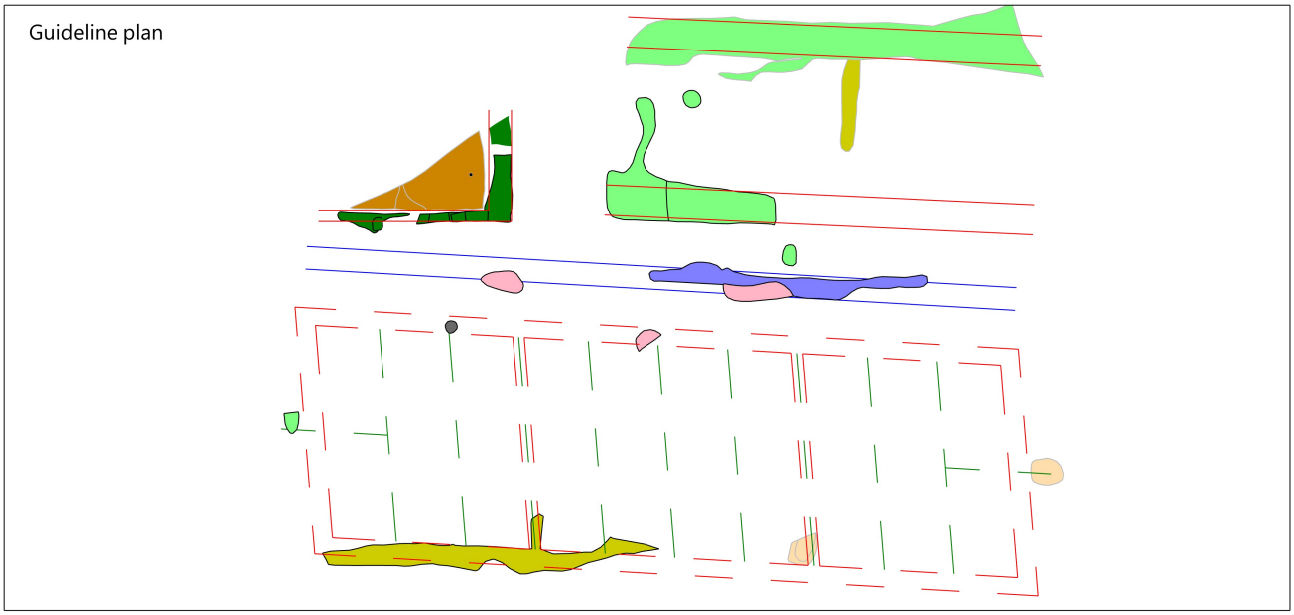
5. Context: placed in line with structure 18 and set closely alongside (possible) structure 16. The east profile shows that the building was set into the northeastern slope of the raised south plot (Fig. STR17-2).
   Ash-rich features (T2 L4 F164/180) and a 'filthy' occupation layer (T2 L4 F158) are suggestive of a drainage gully in the narrow area between this building and structure 16.

Dating: contemporary with structures 16 and 18; overlies structure 13, but probably served a different use; overlain (and succeeded by?) structure 19. Attributed to VIII, Carolingian period, 8th-9th centuries (Table 4).

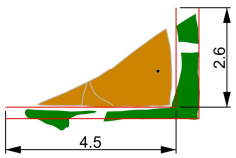
All-features plan



Guideline plan



Dimensioned plan



Hallum-Hellema Structure 17

10 m scale 1:200

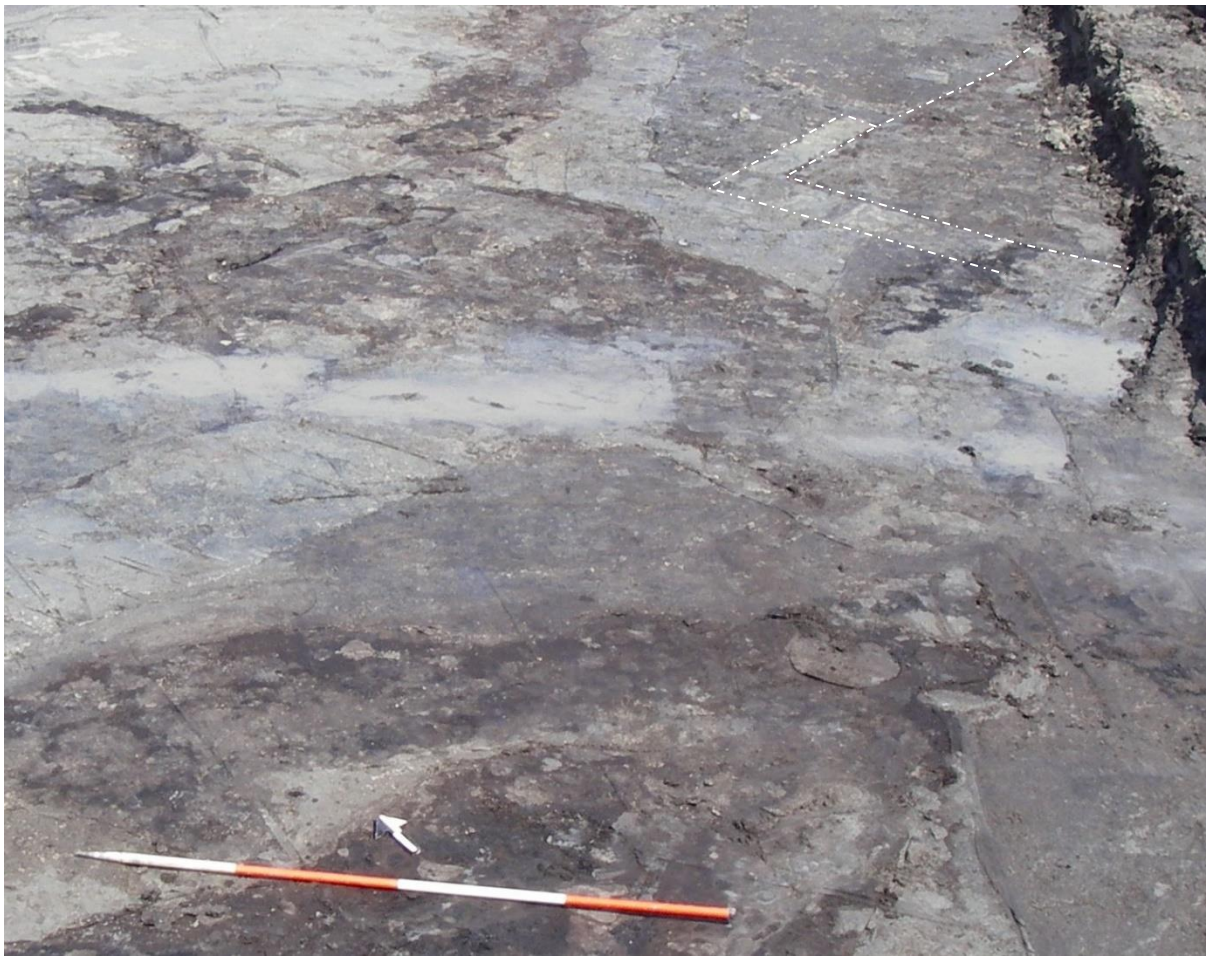


Fig. STR17-1. Trench 2, level 4, showing turf wall (T2 L4 F188, F199 and F204) and interior fill.

Fig. STR17-2. East profile, showing approximate section of the building and its sunken floor area (with two raised floor layers and later, darker infill; F1096).

Structure 18 – Turf shed

Location in excavation: trench 2, level 4.

Number in Tuinstra *et al.* (2010): structure 13.

Functional typology framework:

1. Typology: primary architectural features are two opposing turf walls – northwest long wall (T2 L4 F188; Fig. STR18-1) and southeast wall (T2 L3 F104; Fig. STR18-2). The turf walls are not observable in the east profile, which suggests that the building ended just before the adjacent sunken feature building (structure 17), rather than overlying it. The appendix of the northwest wall further supports this interpretation but the available evidence is not clear enough to suggest a more precise location for the northeast short wall.
   The building's interior width was 3.7 m, its total length at least 10.9 m; classed as Leens C type.

2. Use of space: a distinct dark and straight feature (T2 L3 F100) in the excavation level may be indicative of a subdivision in the building's interior, but this interpretation cannot be verified. Suggested use based on interior width: shed (e.g. barn or workshop).

3. Building technology: turf walls drawn with an indicative thickness of 80 cm in plan, but no cross sections are available to confirm their thickness.

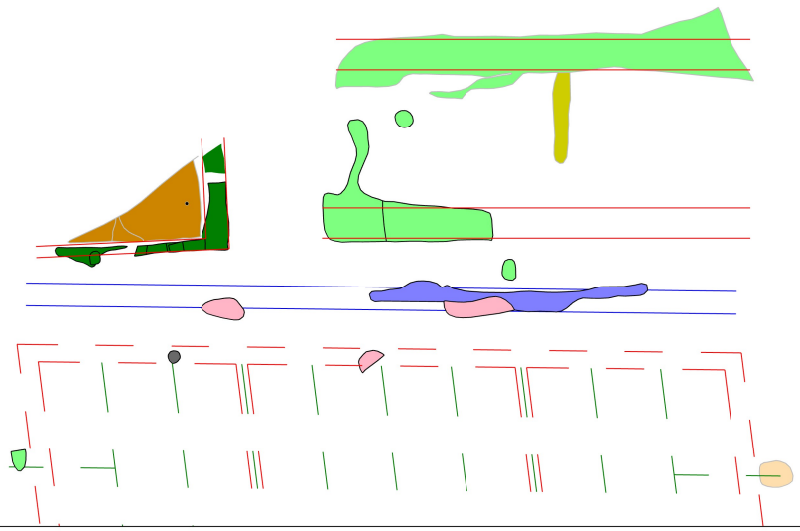
4. Structural design (based on Postma 2015): interpreted as a single-aisled building with roof-supporting turf walls.

5. Context: aligned with structure 17, set alongside structure 16. Ash-rich features (T2 L4 F164/180) and a 'filthy' occupation layer (T2 L4 F158) are suggestive of a drainage gully in the narrow area between this building and the presumed structure 16.

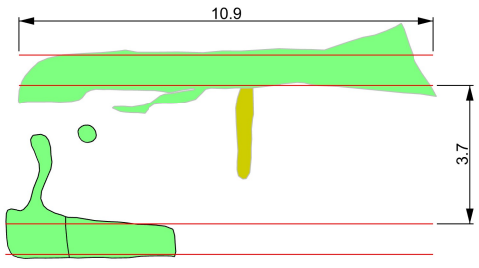
Dating: contemporary with structures 16 and 17; replaced structure 14; succeeded by structure 19. Attributed to phase VIII, Carolingian period, 8th-9th centuries (Table 4).

All-features plan

Guideline plan



Dimensioned plan



Hallum-Hellema Structure 18

10 m scale 1:200

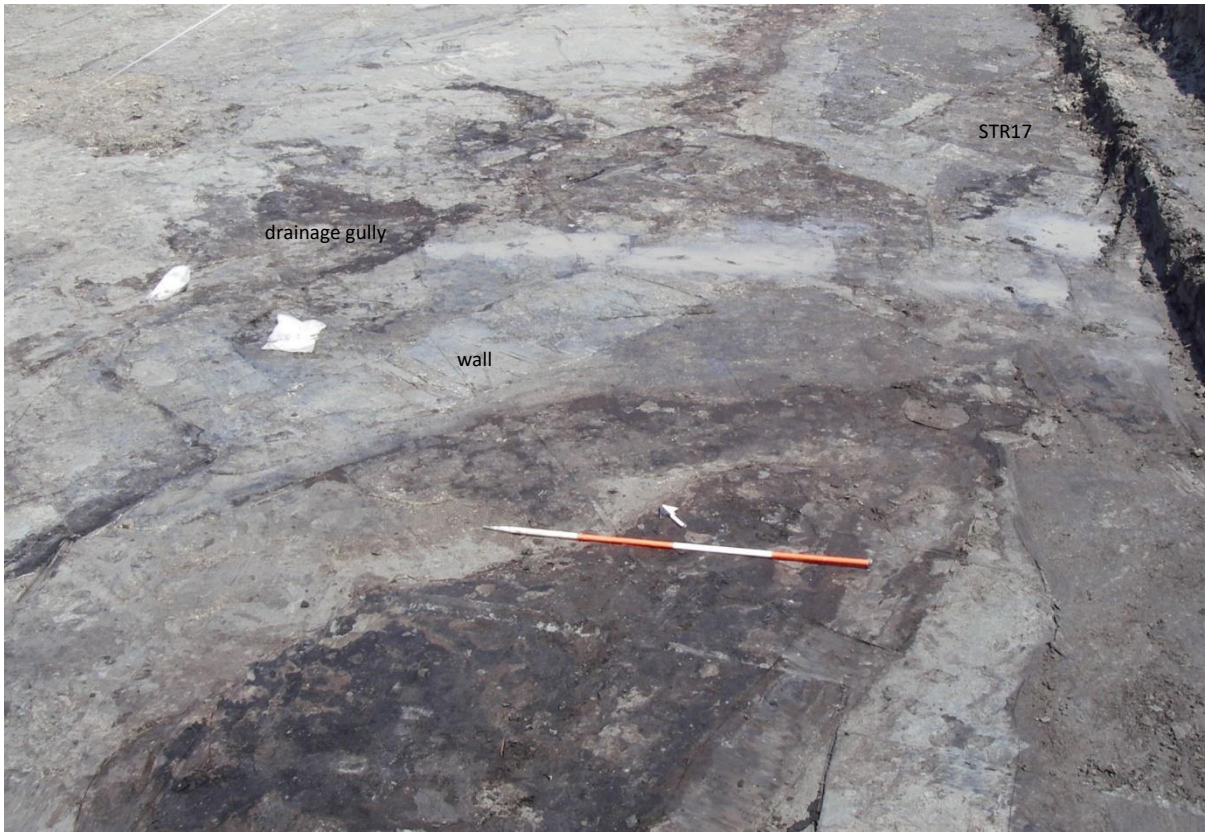


Fig. STR18-1. Trench 2, level 4, showing the lower (northwest) wall (T2 L4 F188) and adjacent drainage gully (T2 L4 F158). Structure 17 is visible in the background.

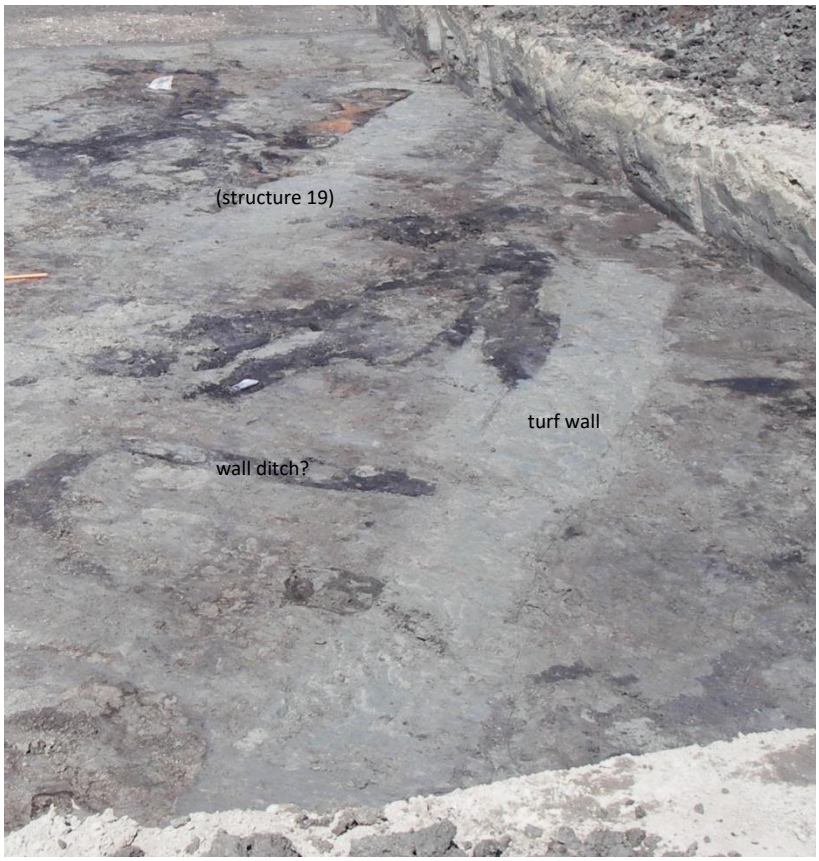


Fig. STR18-2. Trench 2, level 3, showing the higher (southeast) wall (T2 L3 F104) and possible interior partition wall ditch (T2 L3 F100).

Structure 19 – Turf shed (on platform)

Location in excavation: trench 2, level 3; east profile.

Number in Tuinstra *et al.* (2010): structures 16 and 26.

Functional typology framework:

1. Typology: primary architectural feature is the building's northwest long wall (T2 L3 F97; Fig. STR19-1). This wall and its southeast counterpart are clearly visible in the east profile (F930 and F962-964).
   It appears that the southeast wall continued in the excavation level as another feature (T2 L3 F95) with the same width and alignment, which is supported by the clear (but not recorded) wall lines in the excavation level above (Fig. STR19-4). In both levels, these two wall parts appear divided from each other by dark deposits, seemingly resulting from the building's use. This break in the southeast wall is taken to have been the location of a doorway.
   The building's interior width was 3.3 m, its apparent length at least 21.7 m; classed as Leens C type.

2. Use of space: no evidence for subdivision of the interior is recognisable.
   The noticeably great quantities of black soil and burnt material, in several levels of the interior, indicate fire was important in the building's use and has not derived from a single event.
   Suggested use: shed with apparently large internal and external work areas.

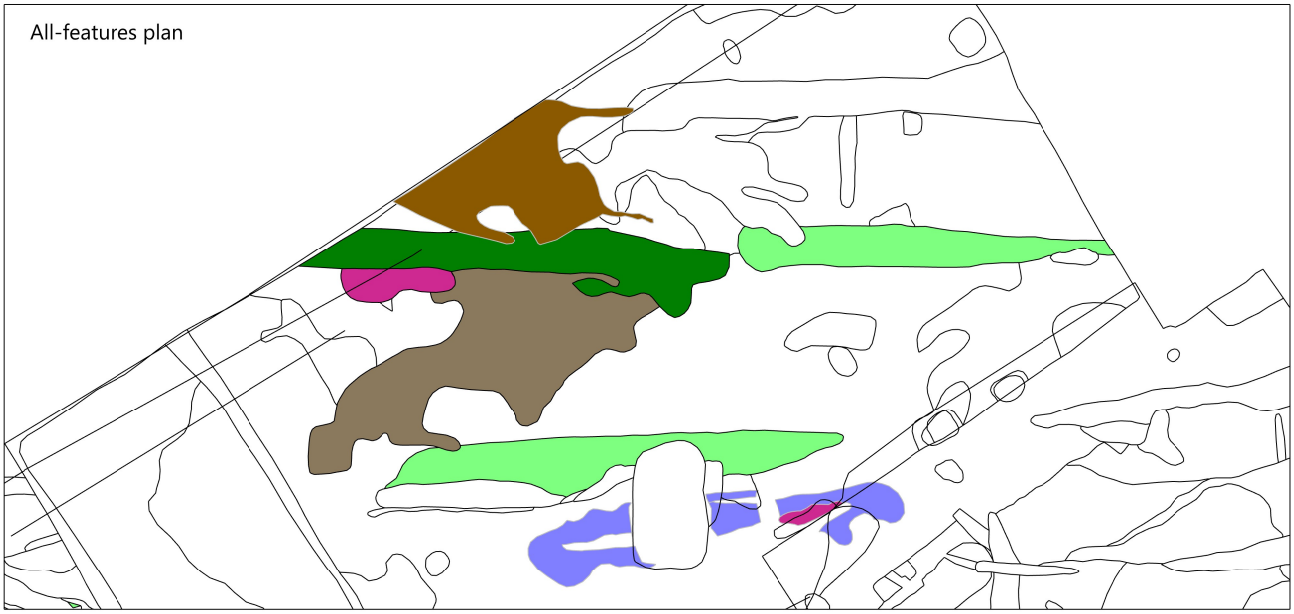
3. Building technology: the plan, profile and section (Fig. STR19-3) show both turf walls were ca 110 cm thick. The thickness of the turves cannot be reliably established.

4. Structural design (based on Postma 2015): interpreted as a single-aisled building with roof-supporting turf walls.

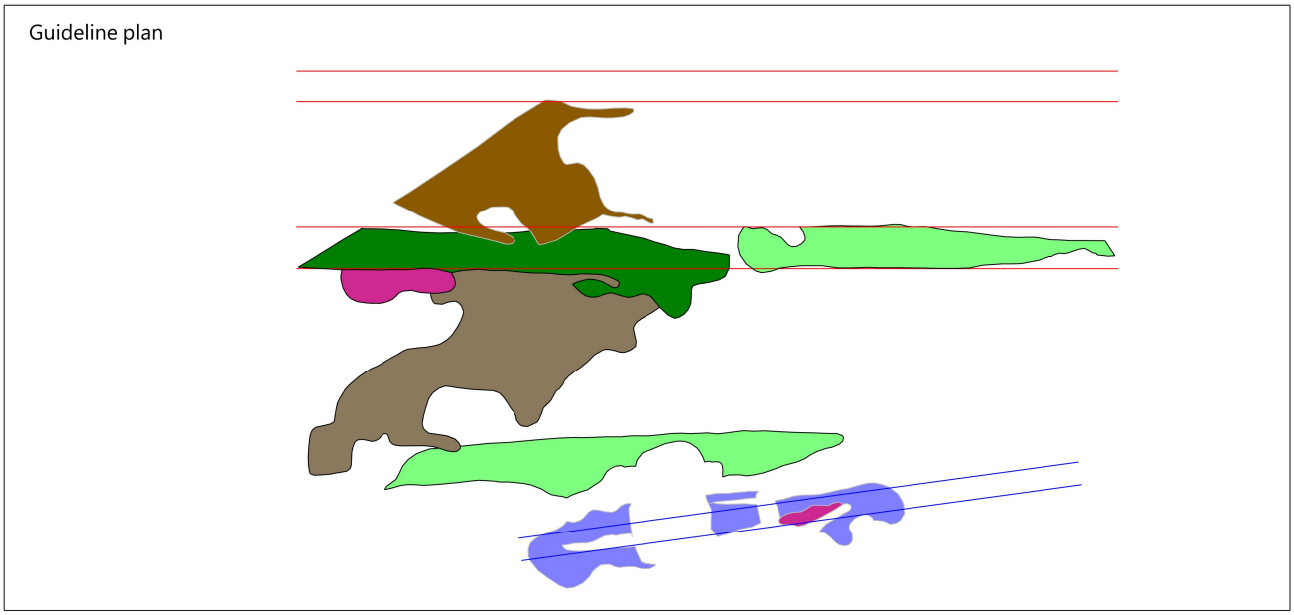
5. Context: another (unconfirmed) turf wall is observable ca 5 m to the northwest of the building (Fig. STR19-1), which does not appear to have been part of a building. No opposing wall with the same orientation can be identified counterpart, but the excavation layer underneath shows a shallow ditch of drain ran alongside it (Fig. STR19-6 and Fig. STR19-4). A more feasible interpretation is that this single wall served as the edge of a platform on which the work area outside structure 19 was situated (see also structure 21).

Dating: no contemporary buildings are known from the south plot; replaced structure 18; succeeded by structure 20. Attributed to phase X, Carolingian period, 8th-9th centuries (Table 4).

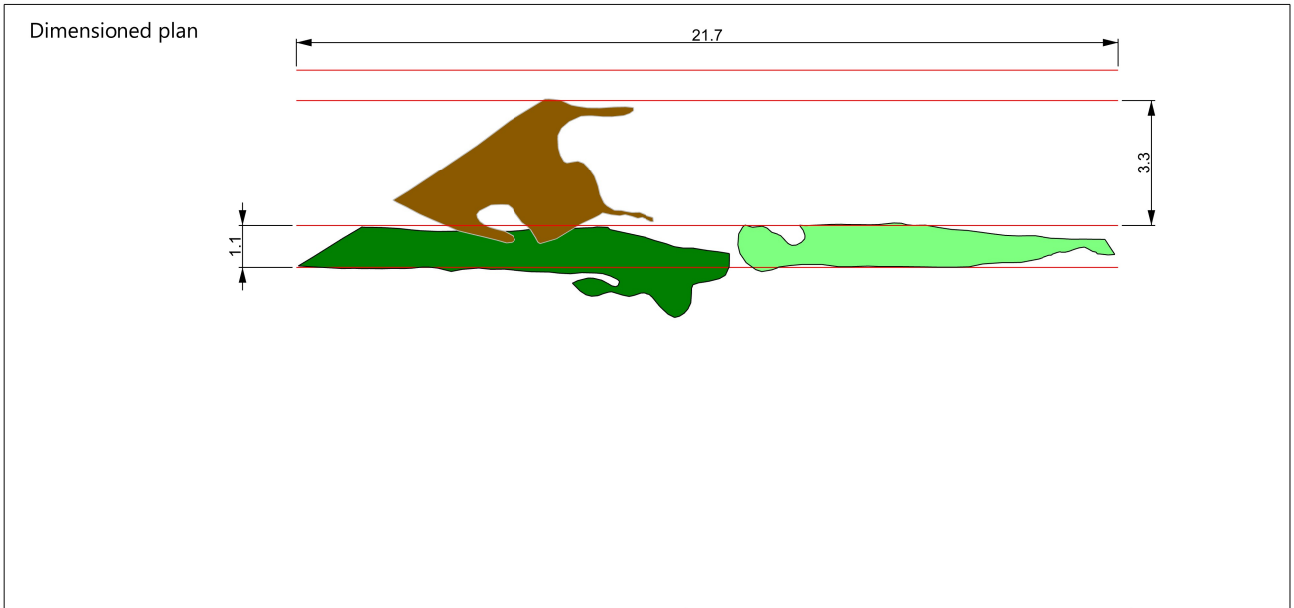
All-features plan



Guideline plan



Dimensioned plan



Hallum-Hellema Structure 19

10 m scale 1:200

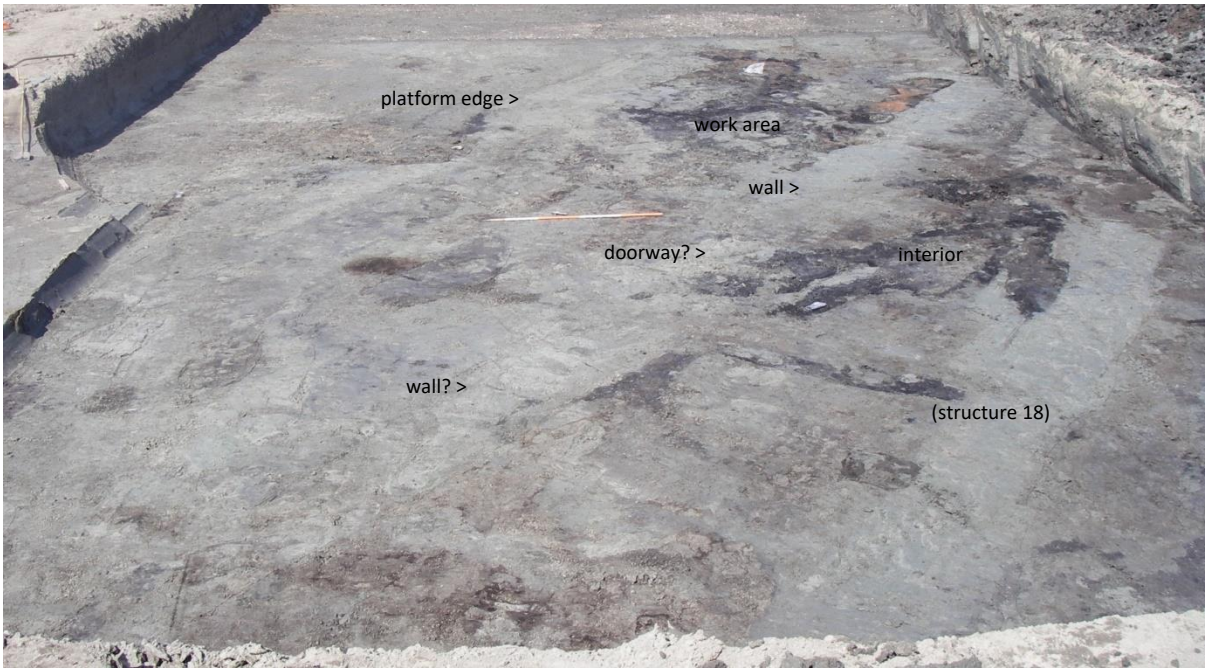


Fig. STR19-1. Trench 2, level 3, showing the northwest wall (2 3 97), platform edge (T2 L3 F79) and intermittent burn layer.

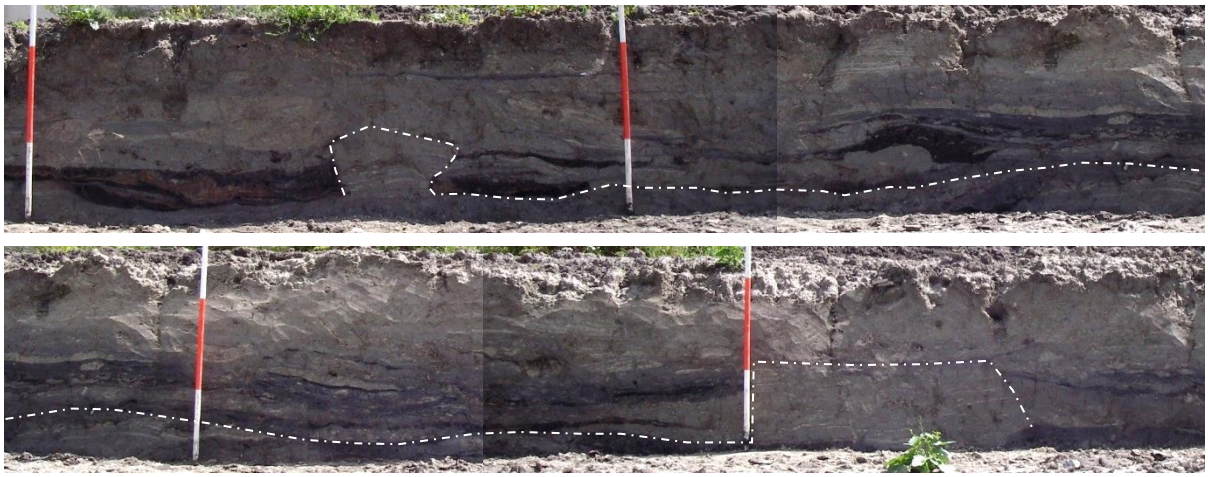


Fig. STR19-2. East profile, showing approximate section through structure 19 in two parts.

Fig. STR19-3. Section of the northwest wall (T2 L3 F97) and abutting burnt material (T2 L3 F106) and floor layers (right).

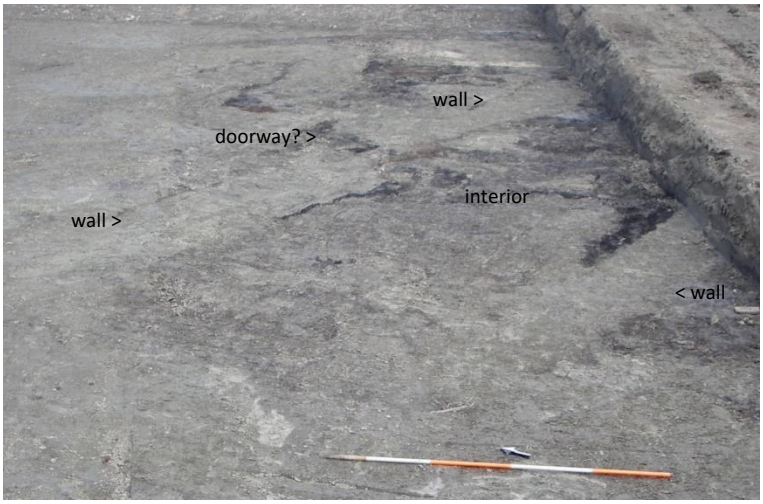


Fig. STR19-4. Trench 2, level 2, showing both turf walls, blackened interior deposits (T2 L2 F6) and presumed entrance.

Fig. STR19-6. Trench 2, level 4, showing drain (T2 L4 F135-137) along platform edge.

Fig. STR19-5. Longitudinal section of ash-rich deposit in drain (T2 L4 F135-137) along platform edge.

Structure 20 – Timber shed

Location in excavation: trench 2, level 1.

Number in Tuinstra *et al.* (2010): structure 21.

Functional typology framework:

1. Typology: primary architectural features are two opposing wall ditches – southeast long wall (T2 L1 F19) and northwest long wall (T2 L1 F13/26), both initially recorded as unspecified layers. Their interpretation as wall ditches is supported by their distance from each other, which corresponds to the interior width of its successor (structure 21), and indirectly by its flanking boundary ditches (see context). Moreover, the contours of a building in this location are clearly recognisable (but otherwise unrecorded) in the excavation level (Fig. STR20-1).
   The building was 3.8 m wide internally and at least 10 m long; not classifiable as a currently known type but regarded as a timber rendition of the Leens C type.

2. Use of space: suggested use is as a shed (e.g. barn or workshop).

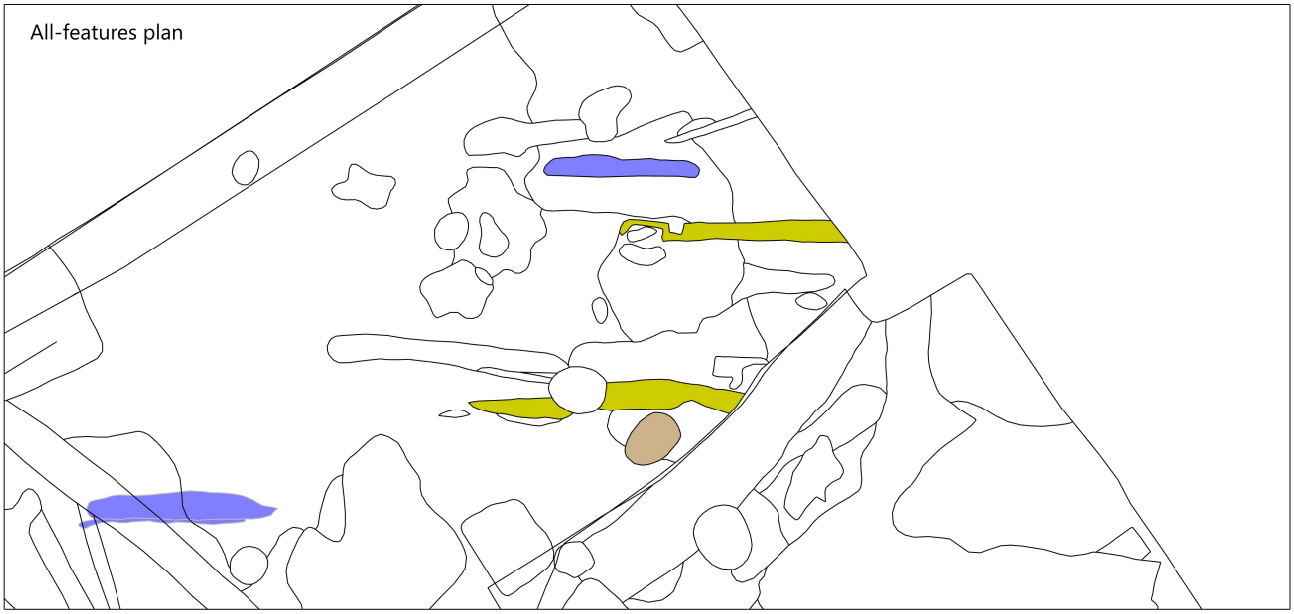
3. Building technology: the apparent use of wall ditches makes this structure different from its turf-walled predecessors on the same plot (structures 14, 18 and 19). No further details of its wall construction have been recorded (but see structure 21).

4. Structural design: interpreted as a single-aisled building with (load-bearing?) timber walls.

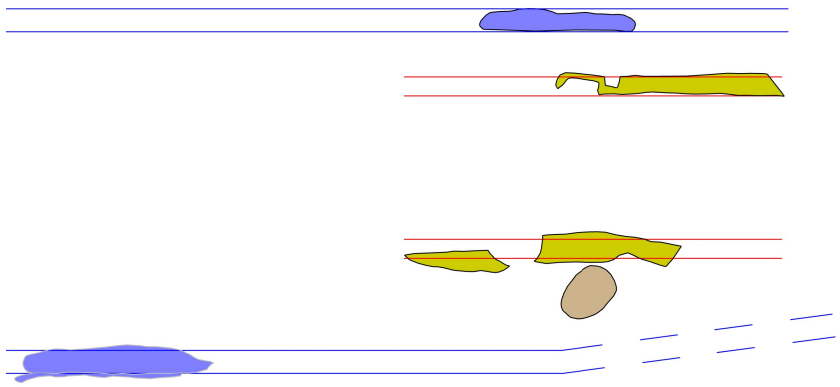
5. Context: a ditch (T2 L1 F38) ran close to the building's southwest long wall; a second ditch (T2 L3 F90) appears to have angled emptied into the earlier drain alongside the platform edge of structure 19 (see also structure 21). An unspecified pit (T2 L1 F11)) was recorded adjacent the northwest wall.

Dating: no contemporary buildings are known from the south plot; replaces structure 19; probably succeeded by structure 21. Attributed to phase X, Carolingian period, 8th-9th centuries (Table 4).

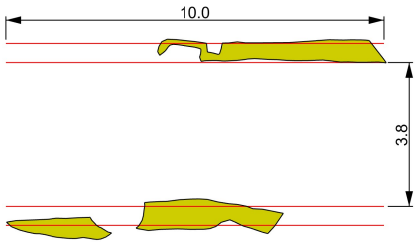
All-features plan



Guideline plan



Dimensioned plan



Hallum-Hellema Structure 20

10 m scale 1:200

Fig. STR20-1. Trench 2, level 1, showing opposing wall ditches on either side of a distinct but unrecorded rectangular building plan.

Structure 21 – Timber shed

Location in excavation: trench 3, level 4.

Number in Tuinstra *et al.* (2010): structure 9.

Functional typology framework:

6. Typology: primary architectural features are the wall ditches of both long walls and the short west wall (T3 L4-5 F88;). A further part of the southern long wall is discernible in level 3 (T3 L3 F54), extending the vertical range of this wall over three successive excavation levels.
   A door opening seems to have been situated in the middle of the short west wall (Fig. STR21-6).
   The building's interior was 3.8 m wide, its length at least 6.8 m; not classifiable as a currently known type but regarded as a timber rendition of the Leens C type.

7. Use of space: several ash-rich features were noted in the building's interior as well as in its immediate surroundings (see context).
   Suggested use is as a shed (e.g. barn or workshop).

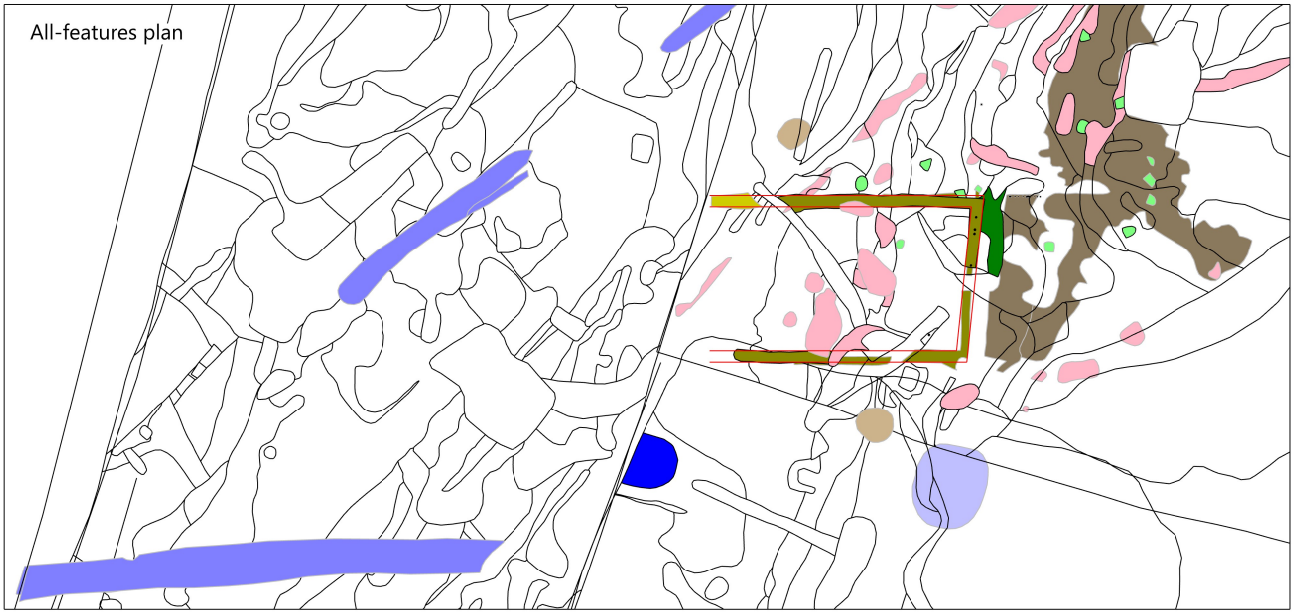
8. Building technology: the walls were constructed in very neatly cut, square-bottomed ditches ca 30 cm wide (Fig. STR21-3 and Fig. STR21-4). Stakes have been recorded in these ditches (Fig. STR21-5), the combination of which is taken to indicate the use of pre-fabricated wattle panels.
   The turf platform edge (see context) was built 45 cm thick, with ca 7 cm thick header courses (Fig. STR21-6).

9. Structural design: interpreted as a single-aisled building with (load bearing?) timber walls.

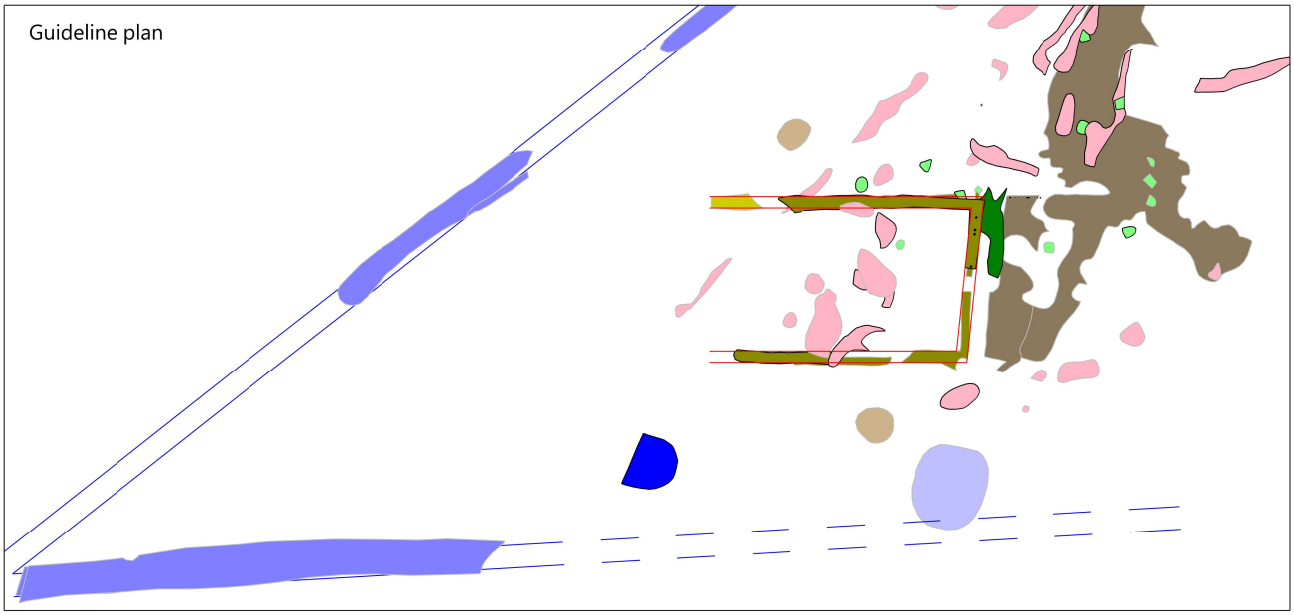
10. Context: the building was built onto the steep west slope of the south plot (Fig. STR21-7), which was terraced for this purpose through the construction of a small platform with turf edge (Fig. STR21-6). The area directly to its west was fenced off with wattle (T3 L5 F213) along its south side.
    Many loose turves and ash-rich features were recorded in and around what is taken to have been a large exterior work area (cf. T3 L5 F174 and T3 L5 F170; Fig. STR21-8). Two water wells (T9 L4-7 F21 and T9 L7 F37) were located directly north of the building and are presumed to have been contemporary. Two unspecified pits were also noted nearby, to the south (T3 L5 F181) and north of the building (T3 L3 F47).
    The building's orientation was distinctly different from that of any other house plan from Hallum-Hellema. Its orientation was matched by a boundary ditch (T2 L1-2 F9) noted in the topmost part of the excavated area. A contemporary ditch (T2 L1 F29, T3 L2 F32, also T3 L2 F33) maintained the orientation of the earlier drain alongside the platform of structure 19, creating a sharply triangular plot in which the building was situated.

Dating: no contemporary buildings are known from the southern plot; assumed to have replaced structure 20; no known successor. Attributed to phase XI, High Middle Ages, 10th-12th centuries (Table 4).

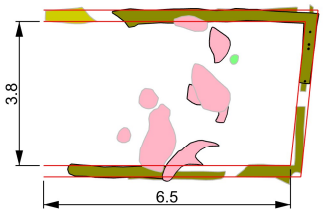
All-features plan



Guideline plan



Dimensioned plan



Hallum-Hellema Structure 21

10 m scale 1:200

Fig. STR21-1. Trench 3, level 3, showing the upper part (T3 L3 F54) of the southern long wall.

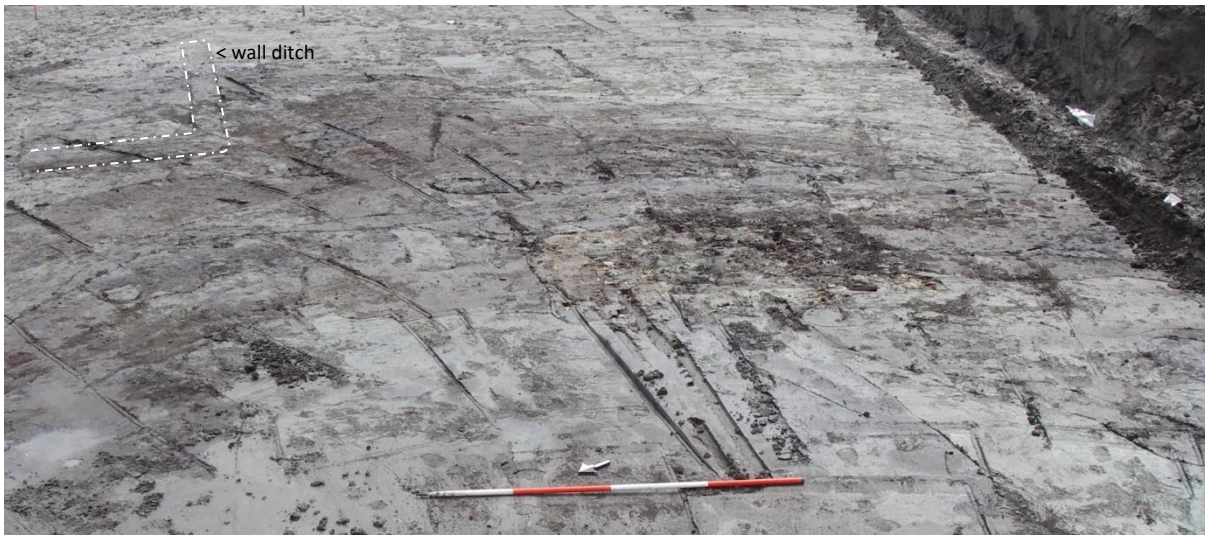


Fig. STR21-2. Trench 3, level 4, faintly showing the contours of the angled wall ditch (T3 L4-5 F88).

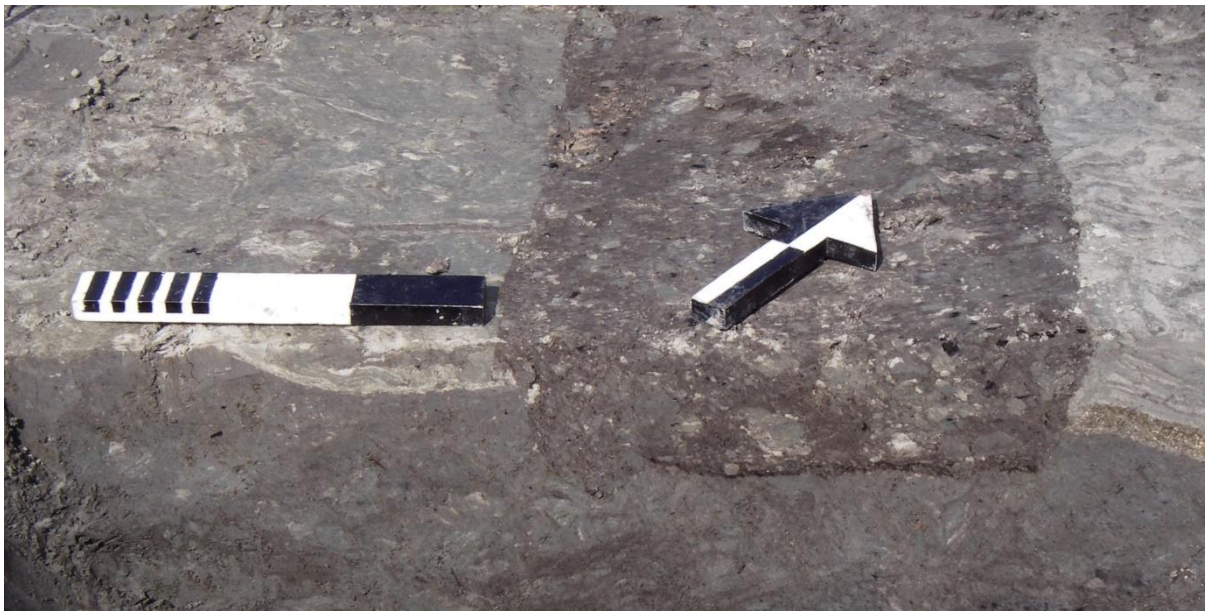


Fig. STR21-3. Section of southern wall ditch (T3 L4 F88), towards its eastern end in level 4.

Fig. STR21-4. Section of the northern wall ditch (T3 L4-5 F88), near its eastern end in level 4.

Fig. STR21-5. Longitudinal section of the southern half of the west wall's ditch (T3 L4-5 F88) and stakes (T3 L4 F146-149), showing clear for the entrance on right.

Fig. STR21-6. Cross section of the western wall ditch (T3 L4-5 F88) and the adjacent turf wall of the platform edge.

Fig. STR21-7. Section in level 5 through the heightening layers underneath the building, showing the steep east slope of the terp from which the building's platform extended.

Fig. STR21-8. Trench 3, level 5, showing the dark 'filthy' occupation layer (T3 L5 F174) to the southwest of the building (with recent rectangular disturbance).

Conclusion and summary

Project overview

As was made evident in the first two chapters of this report, the current project is primarily occupied with establishing a reliable approach to discerning and describing the building remains from Hallum-Hellema. Building on previously established fieldwork methods and post-excavation approaches, it proved necessary to develop a digital, three-dimensional wireframe model (chapter 1). The resulting process first highlighted major concerns with regard to the information recorded during the excavation (chapter 2), but ultimately produced 21 house plans with accompanying descriptions (chapter 3). Despite the challenges faced in the field by the site's excavators and their knock-on effects on post-excavation analyses, it will be evident from the last chapter that Hallum-Hellema has much to contribute to the narrative of early medieval life in the northern Netherlands.

The wider meaning of the house plans presented in this report will be the object of a separate academic study authored by several terp researchers. Some initial remarks, however, should be made to highlight the most important findings. Firstly, the site's chronological and spatial development are summarised.

Phases and dates

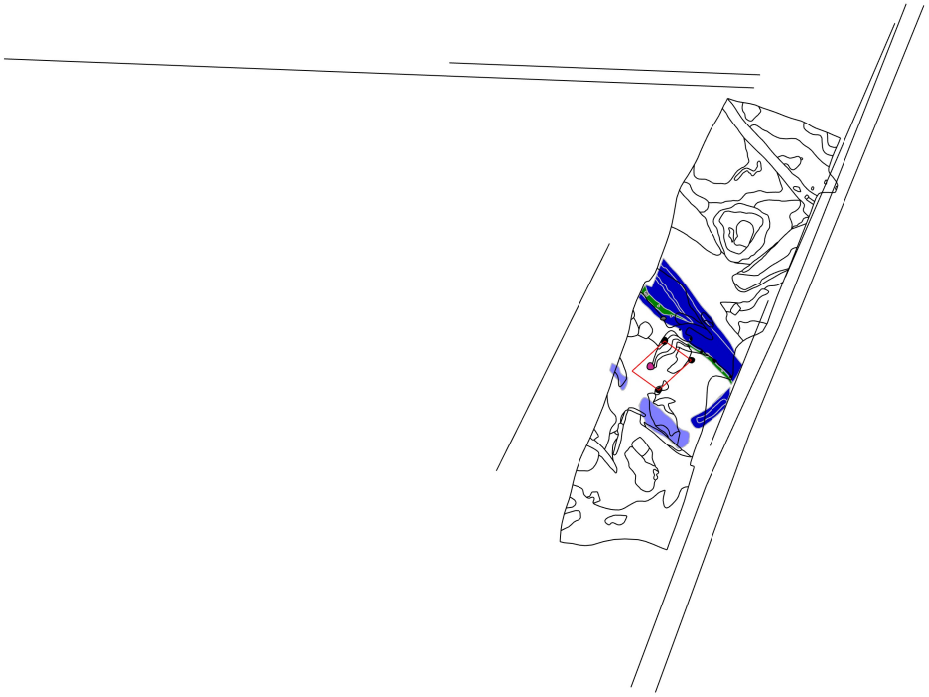
Table 4 presents an overview of the 21 house plans identified in the current project and to which occupation phase and period these plans can be attributed. The phasing and associated dates (in centuries) are taken from the original excavation report (Tuinstra *et al.*, 2010), whereby the relation with the new house plans is based on the phased stratigraphy of the east and north profiles. Through the new house plans and the excavation's 3D model, the site's spatial and chronological development may also be reviewed, but this is beyond the scope of the current project.

<table>
<tr><th colspan="3">North plots</th><th>West plot</th><th colspan="3">South plot</th><th colspan="3">Dating</th></tr>
<tr><th>1</th><th>2</th><th>3</th><th>4</th><th colspan="3">5</th><th>Phase</th><th>Period</th><th>Century</th></tr>
<tr><td colspan="3" rowspan="2"></td><td>(heightening 'stins' terrain)</td><td colspan="3" rowspan="2"></td><td>XII-XIII</td><td>L.MID</td><td>12-15</td></tr>
<tr><td colspan="3">(heightening and re-division)</td><td>STR21
timber shed</td><td>XI</td><td>H.MID</td><td>10(-12)</td></tr>
<tr><td colspan="3" rowspan="2">STR9
turf and timber church</td><td>STR11
timber dwelling (6.4 m)</td><td colspan="3">STR20
timber shed</td><td rowspan="2">X</td><td rowspan="2">CAR</td><td rowspan="2">(8-)9</td></tr>
<tr><td>STR10b
turf outbuilding</td><td colspan="3">STR19
turf shed (on platform)</td></tr>
<tr><td colspan="3" rowspan="2">STR8
timber dwelling (6.2 m)</td><td>STR10a
turf dwelling (6.5 m)</td><td rowspan="4"></td><td rowspan="2">STR16
timber dwelling (5.6 m)</td><td>STR17
SFB</td><td>IX</td><td>CAR</td><td>8(-9)</td></tr>
<tr><td rowspan="3"></td><td>STR18
turf shed</td><td>VIII</td><td>CAR</td><td>8(-9)</td></tr>
<tr><td colspan="2">STR7
timber byre</td><td colspan="2">STR14
turf shed</td><td>STR15
turf building</td><td>VII</td><td>MER</td><td>(6-)7</td></tr>
<tr><td colspan="2">STR6
turf byre</td><td>STR5
turf byre</td><td>STR13
turf byre</td><td>STR12
turf super byre (6.9 m)</td><td>SFB?</td><td>VI</td><td>MER</td><td>6(-7)</td></tr>
<tr><td>STR3
turf byre?</td><td>STR2
turf byre</td><td>STR4
SFB</td><td rowspan="2"></td><td rowspan="2">STR1
granary</td><td rowspan="2"></td><td rowspan="2"></td><td>V</td><td>MIG</td><td>5(-6)</td></tr>
<tr><td colspan="3"></td><td>IV</td><td>E.MIG</td><td>5</td></tr>
</table>

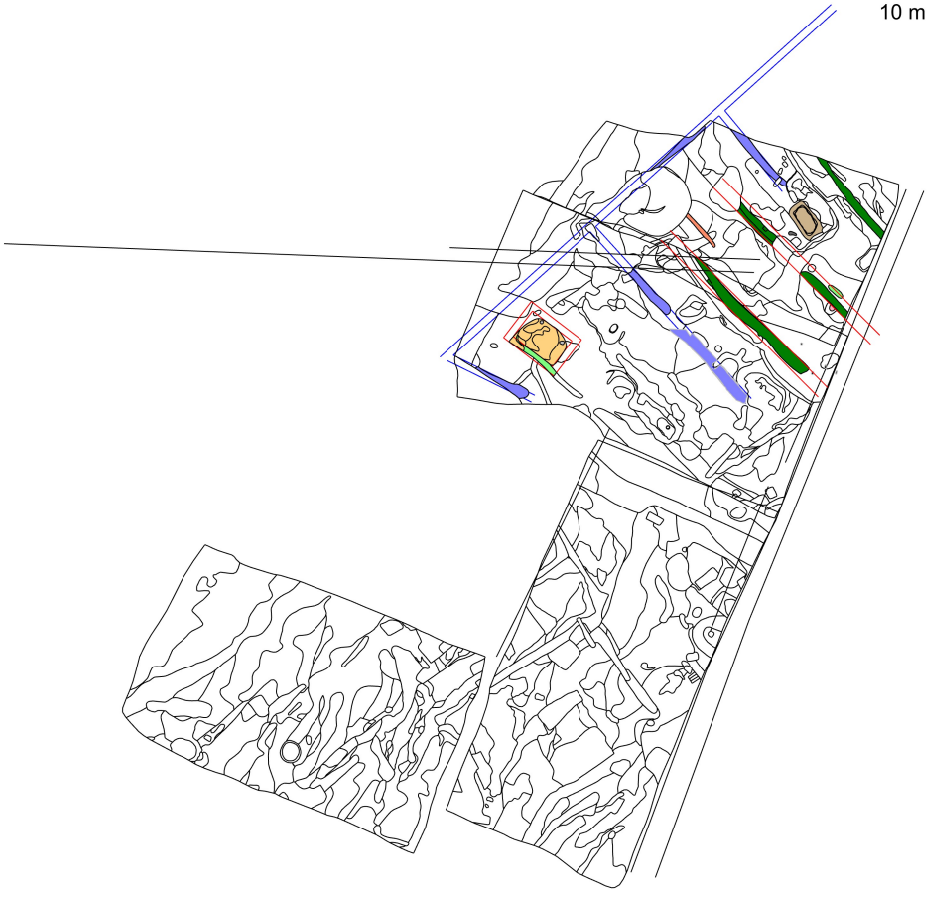
Table 4. Provisional phases and dates based on the dated profile stratigraphy in Tuinstra et al. *(2010).*

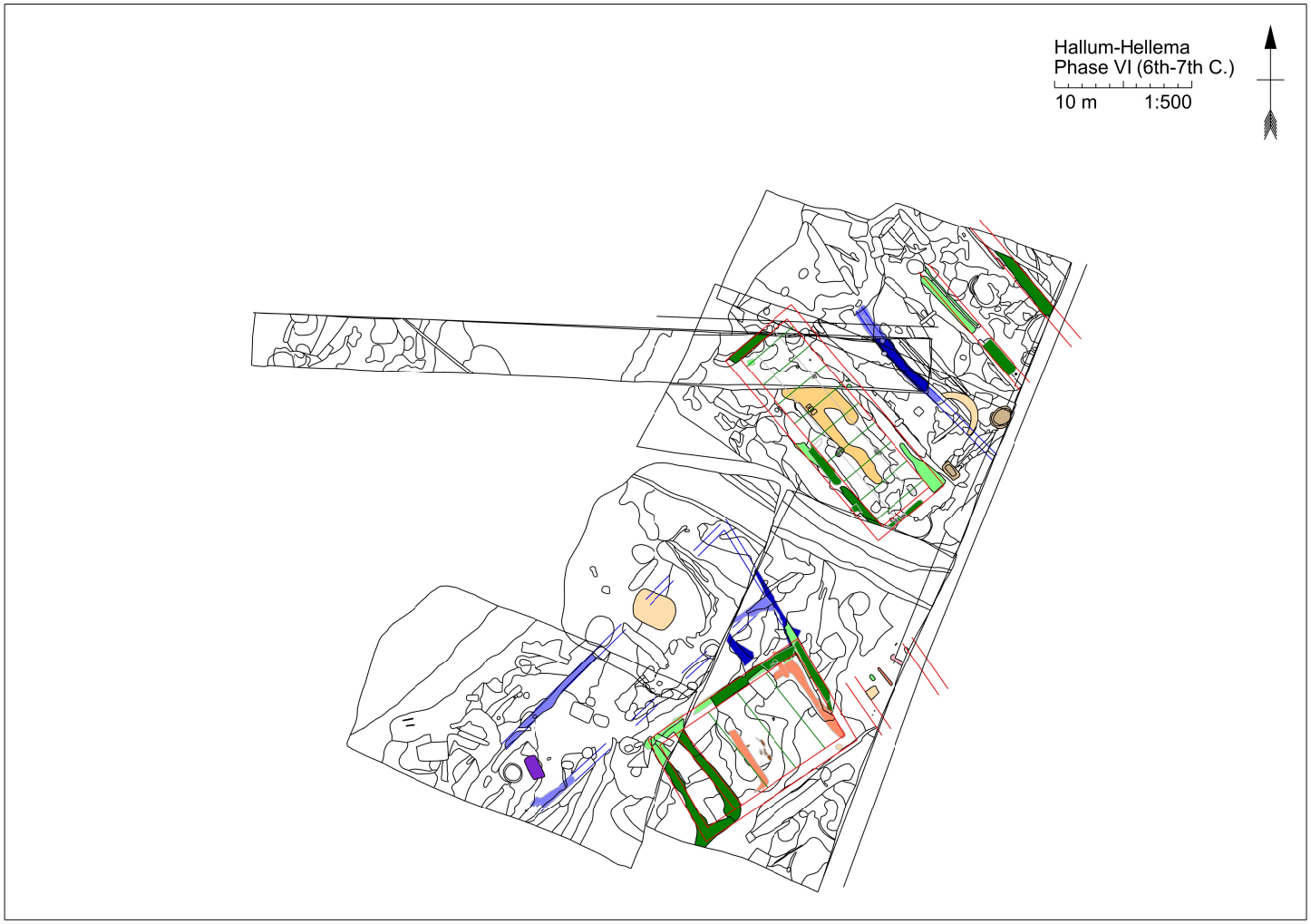
The following site plans present a visual overview of the buildings for each of the existing settlement phases.

Hallum-Hellema
Phase IV (5th C.)
10 m 1:500



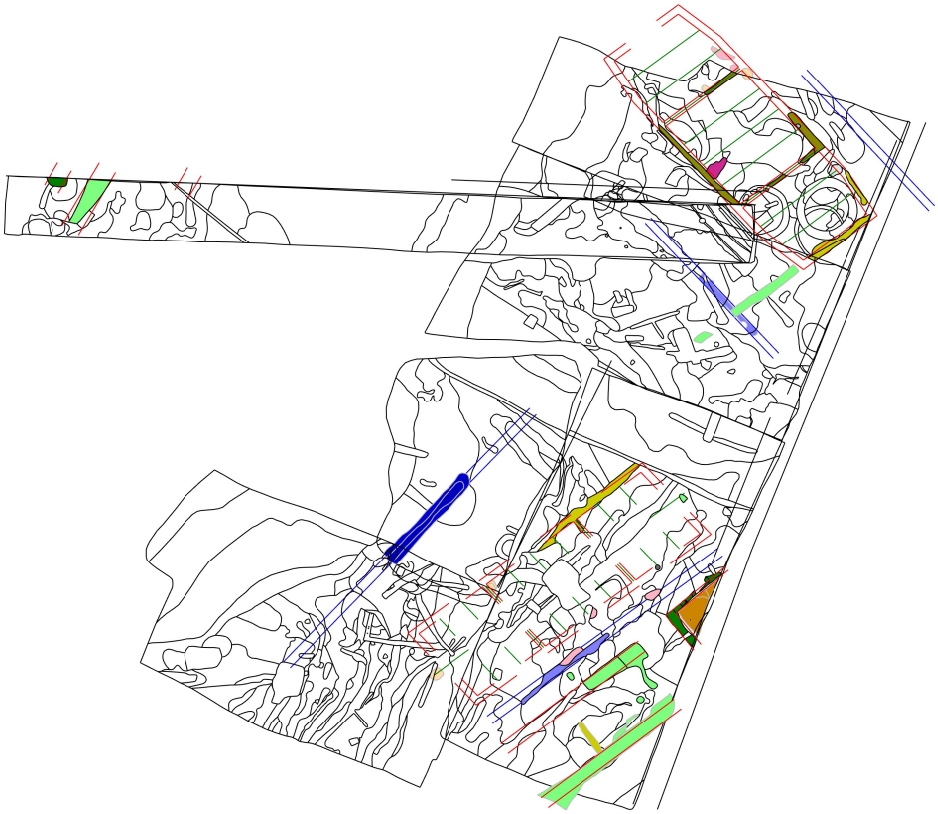
Hallum-Hellema
Phase V (5th-6th C.)
10 m 1:500



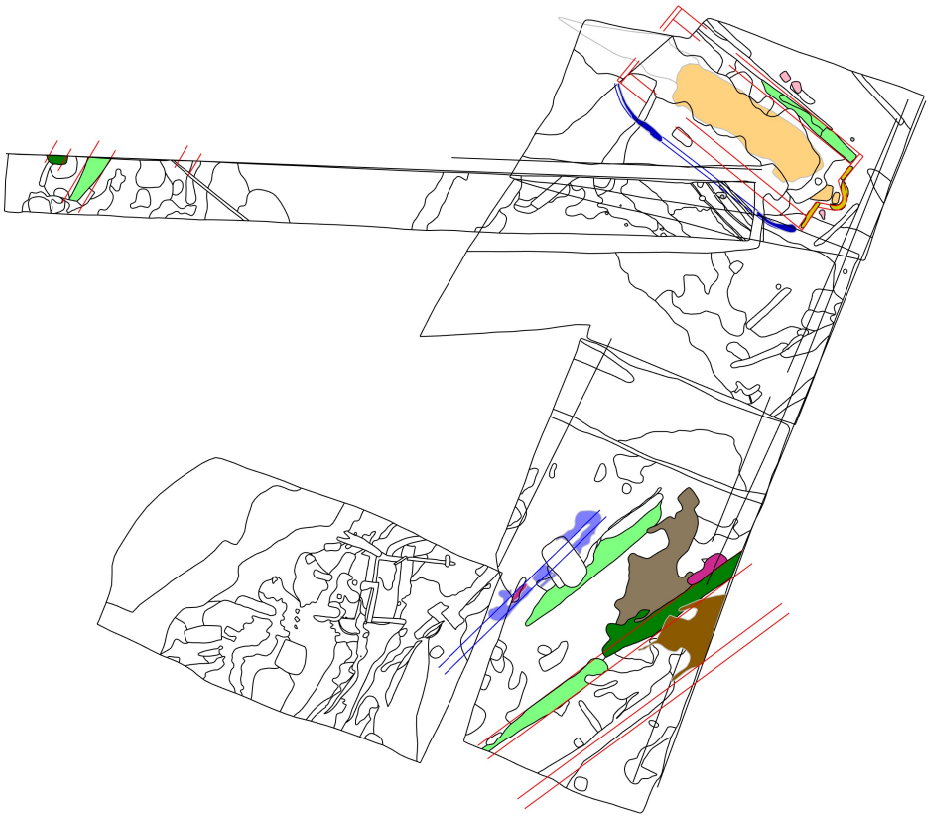

Hallum-Hellema
Phase VI (6th-7th C.)
10 m
1:500

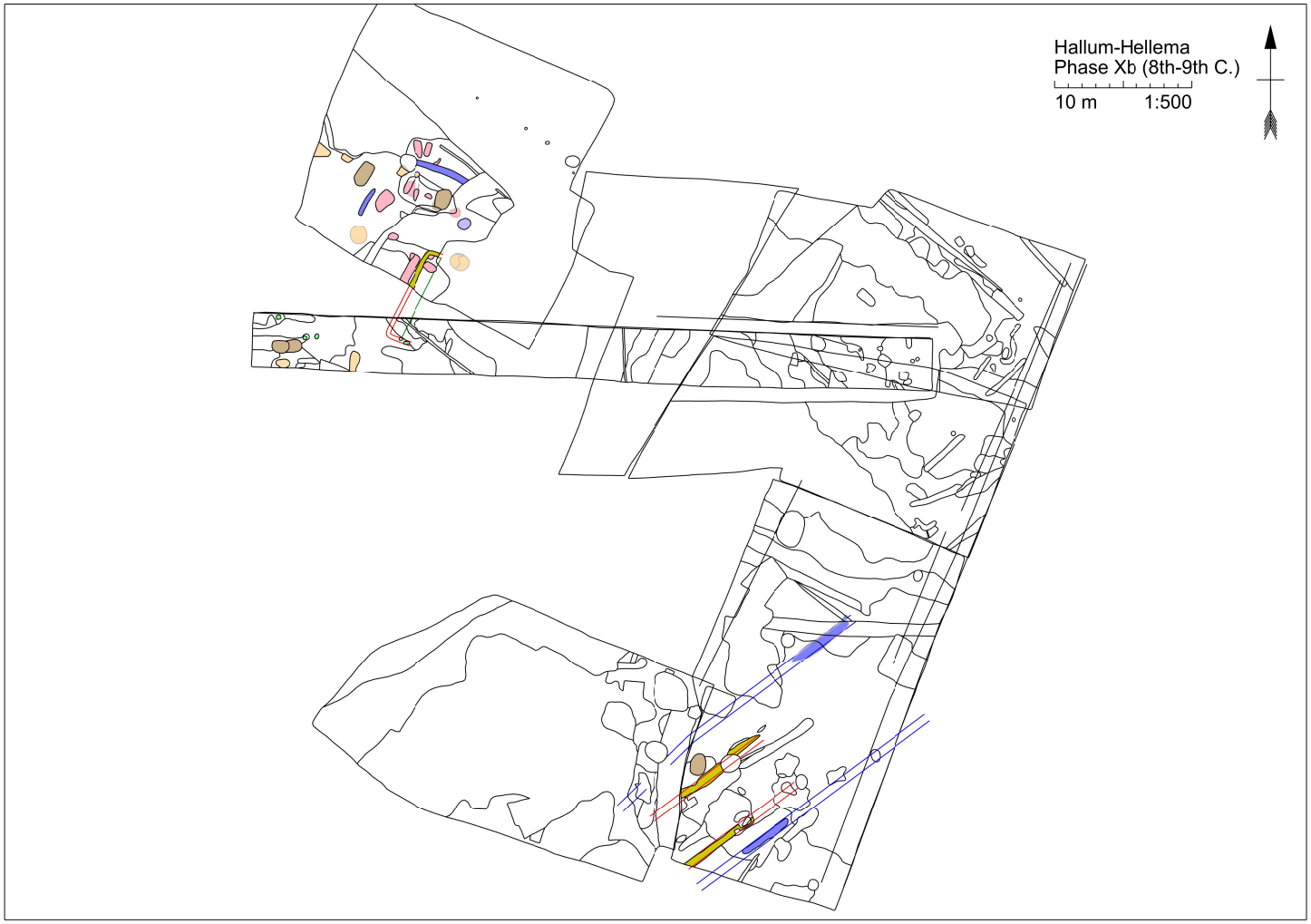

Hallum-Hellema
Phase VII (6th-7th C.)
10 m
1:500

Hallum-Hellema
Ph. VIII-IX (8th-9th C.)
10 m 1:500



Hallum-Hellema
Phase Xa (8th-9th C.)
10 m 1:500




Hallum-Hellema
Phase Xb (8th-9th C.)
10 m
1:500


Hallum-Hellema
Phase XI (10th-12th C.)
10 m
1:500

A brief biography

Migration and Merovingian period

The oldest structure is a granary (structure 1) from the Early Migration period (5th century). It was positioned alongside a flat-bottomed ditch with turf and timber revetment and was itself surrounded with a rectangular, steep-sided ditch. No contemporary buildings have been identified. In the subsequent phase (V; 5th-6th centuries), a single-aisled turf byre (structure 2) stood on one of the northern plots, apparently with a contemporary sunken feature building (structure 4) to its southwest and another turf byre (structure 3) on the plot to its northeast.

In the first part of the Merovingian period (phase VI; 6th-7th centuries), the three northern plots had been combined into two, each with a new turf-walled byre. The northernmost was again single-aisled (structure 6), while its neighbour had interior posts to support a loft (structure 5). It appears that a need for additional storage capacity arose as a circular corn stack was positioned alongside in between the two byres, followed in the next phase (VII; 6th-7th centuries) by an extra byre with loft (structure 7). The latter's construction with timber walls allowed it to be slotted in between its earlier counterparts, although space was evidently tight.

Meanwhile, on the southern plot, an early Merovingian three-aisled byre (structure 13) had also been constructed. Here, too, additional business capacity was sought but with a particular emphasis on cattle, as convincingly illustrated by a remarkably large, nearly 7 m wide byre with U-shaped interior arrangement (structure 12). It appears that a sunken feature building was also associated with this plot, which had gone out of use as the settlement mound continued to expand in north-westerly direction. Two male persons were buried together in the most recently added terp slope, just west of the super byre. Subsequently, in phase VII, structure 12 had been downsized; quite literally as its short walls were reused in a new and relatively short, partially three-aisled building (structure 15). The construction of a narrow (3.7 m), shed-like building alongside it, may indicate that in the latter part of the Merovingian period, priorities had shifted towards artisan production instead of than cattle rearing.

Carolingian period

Come the Carolingian period (phases VIII-IX; 8th-9th centuries), pressure on the northern plots had caused one farm (structure 10) to be relocated on a significant westward expansion of the terp: the western plot. The building was constructed with turf walls, although the near doubling of the thickness of the turves compared to earlier customs may indicate that access to large quantities of suitable grassland had by this time become a concern. The farm that remained on the northern plots, which had now merged into a single plot, avoided this issue by being constructed with walls made of timber – not a more easily obtained in a treeless salt marsh area, but certainly more easily transportable over greater distances. The respectable interior width (6.2 m) of this building (structure 8) appears to have derived from continued commercial success, as its construction was preceded by three corn stacks on the same site.

It is uncertain whether the occupants of the southern plot also managed to commission the construction of a timber dwelling (structure 16), although the construction of a new sunken feature building (structure 17) and turf-walled shed (structure 18) suggest their artisanal ventures were generally successful. In fact, production capacity increased significantly in the latter half of the Carolingian period (phase X; 8th-9th centuries) with the construction of an at least 21 m long work shed (structure 19), equipped with a heavily used raised platform to its northwest. On the western plot, history may have repeated itself as a 6.5 m wide turf-walled building was partially reused for a narrower (3.9 m) building (both structure 10).

Developments on the northern plot, however, had taken a different course. For one, the wide timber building had in the first part of phase X (Carolingian period; 8th-9th centuries) made way for a 4.5 m wide building with long walls again made from turf. Structure 9, however, may still be the most interesting of all identified house plans. Unfortunately, very few details were recorded during excavation, but with a reasonable amount of certainty we may assume this building was in various ways differentiated from its previous and contemporary structures. Its most conservative description is as a building set on a prominent location, atop a long established and recently wealthy farmyard, with a timber gable seemingly designed with an apsis-like central feature, one or possibly two roofed entrance portals on its long walls and a floor area heavily deepened through prolonged and intensive use. It appears a safe deduction to propose that structure 9 was a Carolingian church building, something which further analysis may yet help to ascertain or contradict.

It cannot be said precisely how further developments on the western plot unfolded, although it appears that as agricultural occupation gravitated towards the edge of the terp, a 6.4 m wide timber building (structure 11) was constructed here in the latter part of the Carolingian period (phase X; 8th-9th centuries). Almost all of this building's plan was obliterated when a wide ditch was cut for the medieval tower house, or 'stins' construction on a further eastward expansion of the western plot. A clustering of ash-rich features and large rectangular pits, however, may provide some means of establishing the occupants' business in the future. On the southern plot, the predominance of narrow shed-like buildings continued, albeit now with a focus on timber rather turf walls (structure 20).

High Middle Ages

From the early High Medieval period (phase XI; 10th-12th centuries), the northern plot was adapted for agricultural use causing any church or other building to have to be relocated; no further house plans have been recognised in this area. On the western plot, too, no later buildings can be identified, in part perhaps because these continued their westward migration beyond the reach of the excavation.

Only on the southern plot did occupation clearly continue on previously occupied terrain, albeit that construction on this plot was also significantly impacted by this period's heightening and re-division of the terp for agricultural use. A new timber shed (structure 21) was built into the steep western slope, its terrace expanded by the construction of a tiny platform. Again, the southern workshop building was surrounded by a large area darkened though intensive use and fire-related commercial activity. The reorganisation of this plot into a triangular arrangement, which is clearly reflected in Hallum's historic street plan, and the early urban-archaeological appearance of the small wattled buildings and blackened soil, are characteristic of this early artisanal neighbourhood.

Typological remarks

The developments of the turf and timber buildings as detailed in this report greatly strengthen and expand the typological classification of house plans from the terp region. In their original excavation report, the excavators of Hallum-Hellema were the first to distinguish between relatively long but narrow (Leens A) and uncommonly wide but relatively short (Leens B) turf-walled buildings. The contemporary use within the same early medieval settlement of both types of building, remained intact with the current critical reconsideration of this site's house plans. Moreover, the repeated appearance of even narrower buildings justifies the recognition of a third type of turf building: Leens C type.

The methodological approach used for the current project builds on the existing archaeological custom in the Netherlands of classifying house plans in a typological framework (see section 1.2). By paying specific attention to how past buildings may have functioned in terms of their use and

technical construction, this conventional approach can be enriched. Consequently, this report's contribution to developing a 'functional typology' of salt marsh architecture produced various observations which future cooperation which other archaeological specialists may build on.

Regarding their use, it seems evident from the presented ground plans that buildings of the Leens A type were indeed used as byres. These were initially open-planned in the Migration and early Merovingian period (cf. structures 2 and 6), but were equipped with loft-supporting interior posts as soon as the need for additional storage capacity arose (cf. structures 5, 7 and 13). As previously stated, these byres were 4-4.5 m wide, lengths in Hallum being in the region of 12.8-16 m and any interior posts rarely extending into the apparent work area in the higher end of the building. Exactly such a building has been reconstructed in Firdgum (4.5 x 15 m internally; Postma, 2015).

Fig. 7. Reconstructed turf byre with work area in Firdgum, Friesland.

The current project has (re-)confirmed that the recognition of a separate class of wide turf buildings is indeed justifiable. Nevertheless, important observations concerning this Leens B type must be highlighted. The only reasonably complete house plan of this type is that of structure 12 (see also structure 10), which instead of representing a luxuriously wide, internally partitioned dwelling turns out to have been a Merovingian super byre with an interior arrangement not previously identified in the northern Netherlands. This does not exclude the possibility of the Leens B type being associated with dwellings, as it is self-evident that people still needed to live somewhere (cf. building 6 in relation to number 5 from Leens-Tuinsterwierden in Knol, 1993 or Van Giffen, 1940). Instead, it transpires that the excavation trenches of Hallum-Hellema all targeted the business ends of the early medieval plots, leaving the associated dwellings out of view higher up the terp, directly southeast of the excavation.

On the opposite side of the turf building spectrum, the newly discerned Leens C type adds another strand to turf building typology. It has previously been pointed out that buildings up to ca 3.7 m wide sometimes directly replaced sunken feature buildings (Gerrets and Koning, 1999; Postma, 2015,

2010) and the results from Hallum-Hellema greatly strengthen their association with artisanal production (cf. structures 14, 17-21).

Of a completely different typological style is the presumed church (structure 9) described in more detail in the previous section. Equally deviant of the existing house plan typology is the apparent absence of exterior posts in the late Merovingian and Carolingian timber buildings (cf. structures 7-8 and 16).

Recommendations

It will be evident from the second chapter that careful, detailed and interpretative recording of features during fieldwork is essential to their subsequent post-excavation analysis. In acknowledgement of earlier critique on the use of typological classifications as an end point in archaeological excavation projects (see section 1.2), it is repeated here that typological classifications should be regarded as a starting point for more detailed, specialist analyses of building remains and their associated finds. With that in mind, any building remains are better to be well excavated and minimally published (at first) than poorly recorded and unreliably published in an attempted synthesis of regional settlement developments.

The advent of digital technology such as three-dimensional computerised modelling offers unprecedented possibilities for our understanding of past building traditions. The ready availability of digital photographs, particularly of sections and trench profiles, has been crucial to the success of the present project, albeit that more section photographs would have been welcomed. Greatly restricted was the use of level photographs; lateral photography of excavation levels, for example with remote-controlled drones, may provide a way to resolve this issue for future excavations.

The most important preconditions for a detailed reconstruction of any settlement's development, however, are not technologically advanced at all. These are the long-established customs of planing excavation levels to establish accurate and meaningful feature contours, sectioning (and photographing) copious amounts of these features and documentation large complementary site profiles.

Acknowledgements

Just as this report on early medieval house plans neared its completion in September 2020, two of the northern Netherlands' most established settlement archaeologists passed away: Dr. Piet Kooi and Emeritus Professor Tjalling Waterbolk. The author would like to acknowledge the great impact their long-standing commitment to the excavation, interpretation and publication of house plans has had on the field of settlement archaeology. As a student of Piet Kooi at the Groningen Institute of Archaeology, I was encouraged to think critically about the many assumptions underlying conventional understanding of ancient house construction, particularly regarding evidence of past repairs to houses and, by extension, whether 45°C really was a minimum pitch for thatched roofs. Waterbolk's seminal work 'Getimmerd Verleden' was published when I started writing my Master Thesis on salt marsh architecture, and although the book contributed very little to our understanding of turf buildings at first, I have grown to appreciate its content and deterministic approach as an essential tool for starting any analysis of excavated house plans.

Furthermore, I wish to thank my wife and daughters who have kept me going and high-spirited as I grappled, and long continued to grapple, with unclear building fragments from an analogue and in a digital 3D environment. I am grateful to the *Terpen- and Wierdenland* project and its funders, mentioned in the preface, for the opportunity granted to me to reconsider Hallum's archaeological house plans. Last but not least, Dr. Annet Nieuwhof from the University of Groningen's Terp Research Group has been a much-appreciated encouraging force to me throughout this project.

References

Bazelmans, J., Gerrets, D.A., Koning, J. de, Vos, P.C., 1999. Zoden aan de dijk: kleinschalige dijkbouw in de late prehistorie en protohistorie van noordelijk Westergo. Vrije Fries 79, 7–73.

De Langen, G., Mol, H., 2016: Terpenbouw en dorpsvorming tussen Vlie en Eems in de volle middeleeuwen, in: Nieuwhof, A. (Ed.), Van Wierhuizen tot Achlum. Honderd jaar archeologisch onderzoek in terpen en wierden. Vereniging voor Terpenonderzoek, Groningen, pp. 99-128.

Dijkstra, J., Nicolay, J.A.W. (Eds.), 2008. Een terp op de schop: archeologisch onderzoek het Oldehoofsterkerkhof te Leeuwarden, ADC Monografie 3. ADC ArcheoProjecten, Amersfoort.

Gerrets, D.A., Koning, J. de, 1999. Settlement Development on the Wijnaldum-Tjitsma Terp, in: Besteman et al. (Eds.), The Excavations at Wijnaldum: Reports on Frisia in Roman and Medieval Times Volume 1. Balkema, Rotterdam etc., pp. 73–123.

Huijbers, A., Roessingh, W., Theunissen, L., De Vries, K. de, Doesburg, J. van, Jansen, R., in prep. KNA-leidraad gebouwplattegronden. Stichting Infrastructuur Kwaliteitsborging Bodembeheer, Gouda.

Knol, E., 1993. De Noordnederlandse kustlanden in de Vroege Middeleeuwen (Academisch proefschrift). Vrije Universiteit, Amsterdam.

Koopstra, C.G., 2011. Huttenleem, in: Tuinstra, S.J., Veldhuis, J.R., Nicolay, J.A.W. (Eds.), Hallum, een welvarend dorp aan de monding van de Middelzee: een archeologische opgraving te Hallum, Gemeente Ferwerderadeel (Fr), ARC-Publicaties 205. Archaeological Research & Consultancy, Groningen, pp. 133–136.

Nicolay, J.A.W., 2011. Synthese, in: Tuinstra, S.J., Veldhuis, J.R., Nicolay, J.A.W. (Eds.), Hallum, een welvarend dorp aan de monding van de Middelzee: een archeologische opgraving te Hallum, Gemeente Ferwerderadeel (Fr), ARC-Publicaties 205. Archaeological Research & Consultancy, Groningen, pp. 241–293.

Nicolay, J.A.W. (Ed.), 2010. Terpbewoning in oostelijk Friesland: twee opgravingen in het voormalige kweldergebied van Oostergo, Groningen Archaeological Studies 10. Barkhuis/Groningen University Library, Groningen/Eelde.

Nicolay, J.A.W., 2008. Sporen van gebouwen en woonerven uit de Romeinse tijd, de Volksverhuizingstijd en de Vroege-Middeleeuwen, in: Dijkstra, J., Nicolay, J.A.W. (Eds.), Een terp op de schop: archeologisch onderzoek Het Oldehoofsterkerkhof te Leeuwarden, ADC Monografie 3. ADC ArcheoProjecten, Amersfoort, pp. 43–98.

Nicolay, J.A.W., 2014. Terp Excavation in the Netherlands. In: Smith C. (eds) Encyclopedia of Global Archaeology. Springer, New York, NY. https://doi.org/10.1007/978-1-4419-0465-2_2006

Nicolay, J.A.W., Langen, G.J. de (Eds.), in prep. Landschap, bewoning en exploitatie: Friese terpen in doorsnede: de resultaten van 'Terpenproject Steilkantonderzoek Friesland.'

Nicolay, J.A.W., Pelsmaeker, S., Postma, D., Veenstra, H., 2018. Hallum: "nieuwe Friezen" in beeld, in: Nieuwhof, A., Nicolay, J.A.W., Wiersma, J. (Eds.), De geschiedenis van Terpen- En Wierdenland: een verhaal in ontwikkeling, Jaarverslagen van de Vereniging Voor Terpenonderzoek 100. pp. 149–172.

Nicolay, J.A.W., Postma, D., 2018. Woonstalhuizen uit de late middeleeuwen: variatie in landschap en constructiewijze, in: J.A.W. Nicolay (Ed.), Huisplaatsen in de Onlanden: de geschiedenis van een veeweidegebied, Groningen Archaeological Studies 34. Barkhuis/Groningen University Library, Eelde/Groningen, pp. 254–293.

Nieuwhof, A. (Ed.), 2006. De Wierde Wierum (provincie Groningen): een archeologisch steilkantonderzoek, Groningen Archaeological Studies 3. Groningen.

Nieuwhof, A. (Ed.), 2008. De Leege Wier van Englum: archeologisch onderzoek in het Reitdiepgebied, Jaarverslagen van de Vereniging voor Terpenonderzoek 91. Groningen.

Nieuwhof, A. (Ed.), 2020. The Excavations at Wijnaldum. Volume 2: Handmade and Wheel-thrown Pottery of the first Millennium AD. Groningen Archaeological Studies 38. Groningen.

Postma, D., 2015. Het zodenhuis van Firdgum: middeleeuwse boerderijbouw in het Friese kustgebied tussen 400 en 1300. Terpencentrum, Rijksuniversiteit Groningen / Barkhuis, Groningen / Eelde.
Postma, D., 2010. Salt Marsh Architecture: Catalogue, Technology and Typological Development of Early Medieval Turf Buildings in the Northern Coastal Area of the Netherlands.
Theuws, F., 2014. Vroegmiddeleeuwse huisplattegronden uit Zuid-Nederland en hun weergave, in: Lange et al. (Eds.), 2014. Huisplattegronden in Nederland: archeologische sporen van het huis. Barkhuis/Rijksdienst voor het Cultureel Erfgoed, Eelde/Amersfoort.
Tuinstra, S.J., Veldhuis, J.R., 2011. Resultaten, in: Tuinstra, S.J., Veldhuis, J.R., Nicolay, J.A.W. (Eds.), Hallum, een welvarend dorp aan de monding van de Middelzee: een archeologische opgraving te Hallum, Gemeente Ferwerderadeel (Fr), ARC-Publicaties 205. Archaeological Research & Consultancy, Groningen, pp. 29–110.
Tuinstra, S.J., Veldhuis, J.R., Nicolay, J.A.W., 2011. Hallum, een welvarend dorp aan de monding van de Middelzee: een archeologische opgraving te Hallum, gemeente Ferwerderadeel (Fr), ARC-publicaties 205. Archaeological Research & Consultancy, Groningen.
Van der Velde, H.M., 2010. Getimmerd verleden (recensie van H.T. Waterbolk 2009). Jaarverslagen van de Vereniging voor Terpenonderzoek 93, 176–183.
Van Giffen, A.E., 1940. Een systematisch onderzoek in één der Tuinster Wierden te Leens. Jaarverslagen van de Vereniging voor Terpenonderzoek 20–24, 26–107.
Waterbolk, H.T., 2010. Wonen op de Wadden: 1500 jaar boerderijbouw op onbedijkte kwelders, Lezingenreeks. Waddenacademie, Leeuwarden.
Waterbolk, H.T., 2009. Getimmerd verleden: sporen van voor- en vroeghistorische houtbouw op de zand- en kleigronden tussen Eems en IJssel, Groningen Archaeological Studies 10. University of Groningen/Archaeological Research & Consultancy/Barkhuis, Groningen/Eelde.